INFORMATICS INSTITUTE OF TECHNOLOGY

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Unit Code and Description: DOC 334 Introduction to Programming in Python – P2

Module leader: Mr. Nishan Saliya Harankahawa

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Assignment Number: 1

Student Name: P.D. Bambaravanage

Student ID: 20221222

I. Abstract

This report discusses the implementation of a Python program that simulates the game of "20x2". The game involves two players, a human player and a computer, and is played by rolling a dice to move a pawn across a board consisting of 20 blocks. The objective of the game is to be the first player to reach or pass the 20th block. The report outlines the gameplay mechanics, implementation details, and solution approach used in the Python program. It also highlights the different Python modules used, including "random", "time", "game_summary", "game_session_textfile", and "tableANDdiceroll". The program allows players to play multiple games, displays game summaries, and writes the game session to a separate text file with a unique name for each session. Overall, the Python program provides an interactive and engaging way for players to enjoy the "20x2" game while also tracking their progress and game session history.

II. Acknowledgement

I would like to express my deepest gratitude to all the individuals who have provided me with their unwavering support and guidance throughout my work on this course work following the DOC 334 module. Firstly, I extend my heartfelt thanks to my module leader, Mr. Nishan Saliya and my tutorial lecturer, Mr. Namal Malalasena for their invaluable insights and feedback that helped me to complete this project successfully. I would also like to acknowledge the contributions of my parents and family members for their continuous support, motivation, and belief in me throughout this endeavor.

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1. Problem statement

1.1. Introduction

"20 x 2” game involves two players, a human player and a computer, and is played by rolling a dice to move a pawn across a board consisting of 20 blocks. The objective of the game is to be the first player to reach or pass the 20th block.

1.2. Gameplay

If a player rolls a 6, they can enter the game board, but the actual move will happen with the next dice roll. Until 6 appears, the player’s pawn is not permitted to enter the board, and they need to keep rolling the dice.

The pawn is represented by the letter “X” for both the human player and the computer player. Two black holes are present on the board at block number 7 and 14 for both players. They are denoted by the letter “O”. If a player lands on a black hole, they must move back to the first block, but they may pass over it without getting a penalty.

The number of moves that a player can make is equal to half of the dice value. For example, if a player rolls a 6, they can move their pawn three blocks forward. If they roll a 4, they can move two blocks, and if they roll a 5, they can move two blocks (ignoring the decimal part of 0.5). If a player rolls a 1, they do not move at all. The game continues until one of the players reaches or passes the 20th block.

1.3. Implementation

The implementation of the game is entirely in the command console, without the use of an integrated development environment (IDLE). The game board is displayed in the console, and players take turns rolling the dice and moving their pawns. The game stops once a player reaches or passes the 20th block. At the end of the game, the session is saved in a separate text file with a unique name in the format of YYYY_M_D_H_M.txt, where YYYY represents the year, M represents the month, D represents the day, H represents the hour, and M next to H represents the minute. The text file includes a summary of the game, including the total number of moves and black hole hits for each player, as well as whether the player won or lost.

2. Solution

The Python program provided as a solution to the problem statement simulates the game of "20x2" by utilizing various Python modules such as "random", "time", "game_summary", "game_session_textfile", and "tableANDdiceroll". It implements the game mechanics, prints game summaries, and writes the game session to a text file.

The program starts by defining and initializing variables and importing the necessary modules. It then displays a welcome message and provides instructions for playing the game. The game board consists of 20 blocks, numbered 1 to 20, with two black holes located at blocks 7 and 14. The game involves two players taking turns rolling a dice and moving their pawn on the board with the objective of reaching or passing block 20 before the other player.

The program uses a while loop to simulate the game and calls the "table_diceRolls" function from the "tableANDdiceroll" module to play the game. The "table_diceRolls" function is responsible for creating and initializing several variables needed to simulate the game. It creates a game board, assigns the black holes to specific positions in the table, and shows the player's and computer's locations on the table after each dice roll. The function also checks if a player lands on a black hole and moves them back to block 1 if necessary.

The players take turns rolling a dice and moving their pawn on the board based on the value of the dice roll. The number of blocks a player can move is equal to half of the dice value. If a player rolls a 6, they can move 3 blocks, if they roll a 5, they can move 2 blocks, and if they roll a 1, they don't move at all.

The "table_diceRolls" uses the built-in Python modules "random" and "time" .The "random" module generates a random number between 1 and 6 for each player's dice roll, while the "time" module is used to add a small delay before displaying the dice roll result to make the game feel more interactive.

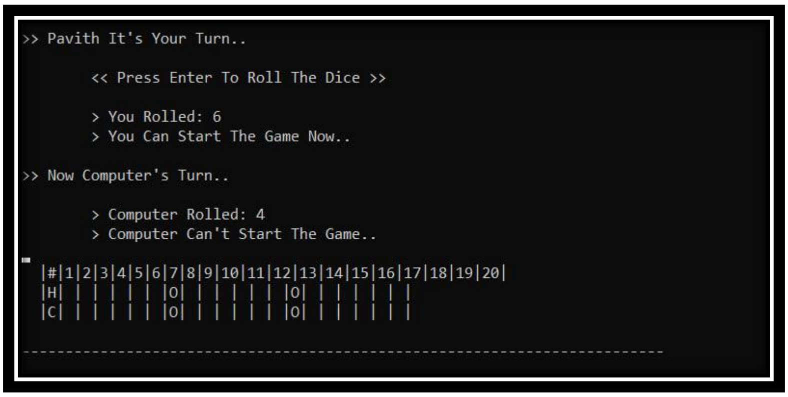
Additionally, the "table_diceRolls" function imports two other modules, "game_summary" and "game_session_textfile". The "game_summary" module is designed to provide a summary of the game once it has ended. It displays important information such as the total number of moves made by the human player and the computer, the number of times each player landed on a black hole, and ultimately, which player won the game. This module provides a clear and concise summary of the game, allowing the player to quickly review the game's outcome and understand the key details of the game session. The "game_session_textfile" module is designed to create a text file containing a detailed summary of the game session. This includes the total number of moves and black hole hits for each player, as whether the player won or lost. The file is saved with a time-stamped name to ensure that each game session is uniquely identified and saved separately. This allows players to keep a record of their game sessions and track their progress over time.

After each game, the program prompts the player to enter whether they want to play another game or not. If the player enters "yes" or "Yes", the loop continues by assigning the value 1 to the "start_again" variable. Otherwise, the loop is excited by incrementing the "start_again" variable and using the "break" statement.

In summary, the solution provides a Python program that simulates the game "20x2" and implements the game mechanics, displays instructions and a welcome message for the user, allows the user to play multiple games, and provides game summaries and writes the game session to a text file.

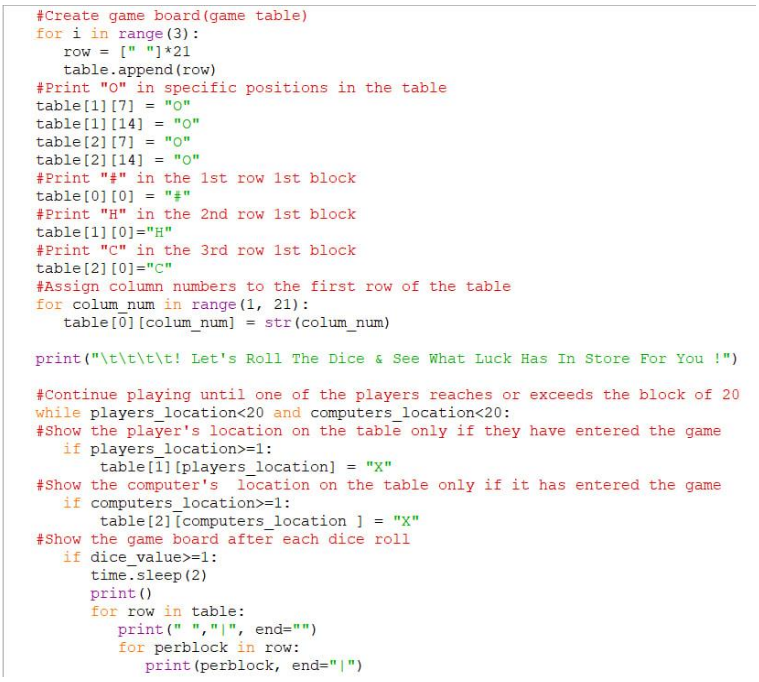
3. Screenshots of the program output in various states

3.1. Problem 1- Game board not printing correctly



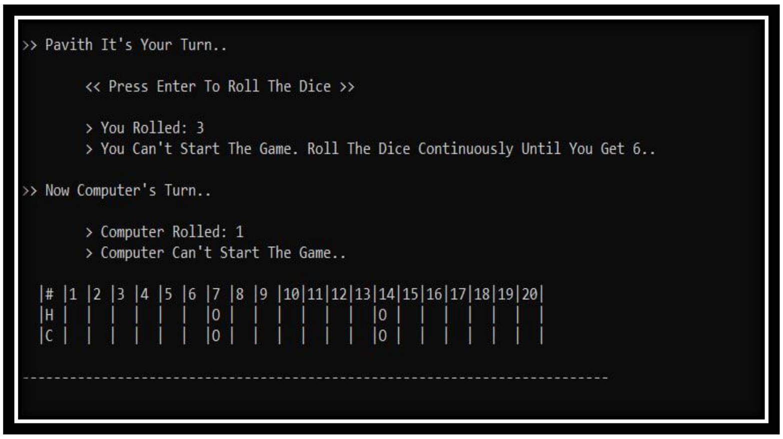
```
>> Pavith It's Your Turn..

        << Press Enter To Roll The Dice >>

        > You Rolled: 6
        > You Can Start The Game Now..

>> Now Computer's Turn..

        > Computer Rolled: 4
        > Computer Can't Start The Game..

  |#|1|2|3|4|5|6|7|8|9|10|11|12|13|14|15|16|17|18|19|20|
  |H| | | | | | |O| | | | | | |O| | | | | | |
  |C| | | | | | |O| | | | | | |O| | | | | | |

--------------------------------------------------------------------------
```

Figure 1:3.1-Problem 1- Incorrect output



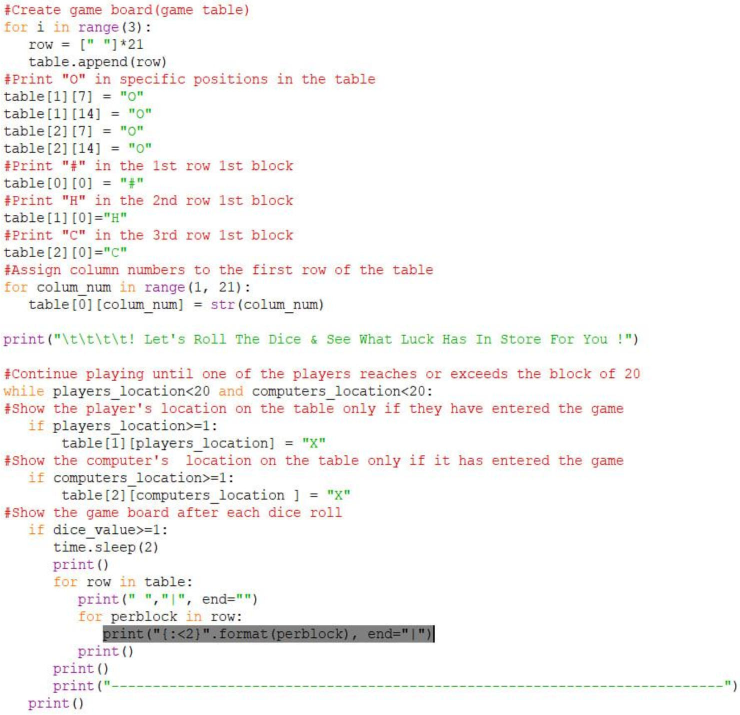
```
#Create game board(game table)
for i in range(3):
   row = [" "]*21
   table.append(row)
#Print "O" in specific positions in the table
table[1][7] = "O"
table[1][14] = "O"
table[2][7] = "O"
table[2][14] = "O"
#Print "#" in the 1st row 1st block
table[0][0] = "#"
#Print "H" in the 2nd row 1st block
table[1][0]="H"
#Print "C" in the 3rd row 1st block
table[2][0]="C"
#Assign column numbers to the first row of the table
for colum_num in range(1, 21):
   table[0][colum_num] = str(colum_num)

print("\t\t\t\t! Let's Roll The Dice & See What Luck Has In Store For You !")

#Continue playing until one of the players reaches or exceeds the block of 20
while players_location<20 and computers_location<20:
#Show the player's location on the table only if they have entered the game
   if players_location>=1:
       table[1][players_location] = "X"
#Show the computer's  location on the table only if it has entered the game
   if computers_location>=1:
       table[2][computers_location ] = "X"
#Show the game board after each dice roll
   if dice_value>=1:
      time.sleep(2)
      print()
      for row in table:
         print(" ","|", end="")
         for perblock in row:
            print(perblock, end="|")
```

Figure 2:3.1- Problem 1- Incorrect code



```
>> Pavith It's Your Turn..

        << Press Enter To Roll The Dice >>

        > You Rolled: 3
        > You Can't Start The Game. Roll The Dice Continuously Until You Get 6..

>> Now Computer's Turn..

        > Computer Rolled: 1
        > Computer Can't Start The Game..

  |# |1 |2 |3 |4 |5 |6 |7 |8 |9 |10|11|12|13|14|15|16|17|18|19|20|
  |H |  |  |  |  |  |  |O |  |  |  |  |  |  |O |  |  |  |  |  |  |
  |C |  |  |  |  |  |  |O |  |  |  |  |  |  |O |  |  |  |  |  |  |

--------------------------------------------------------------------------
```

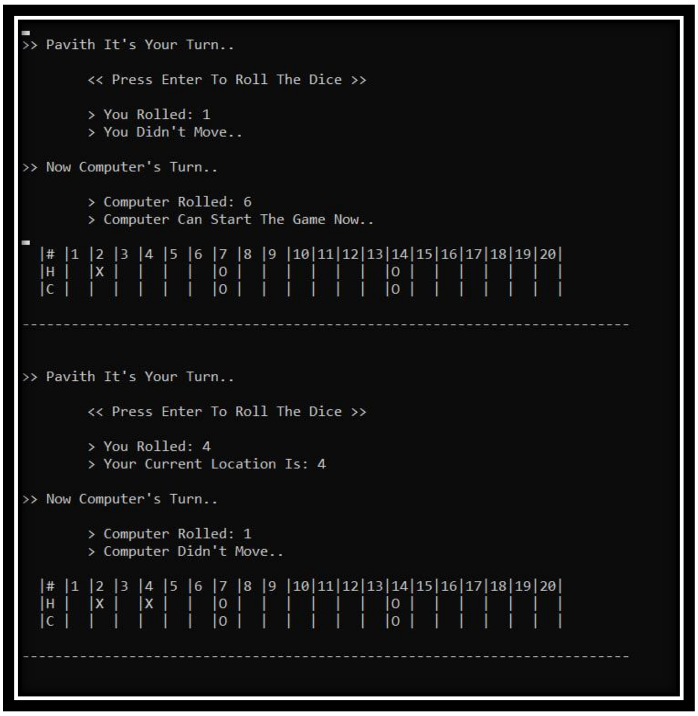
Figure 3:3.1- Problem 1- Correct output



```
#Create game board(game table)
for i in range(3):
   row = [" "]*21
   table.append(row)
#Print "O" in specific positions in the table
table[1][7] = "O"
table[1][14] = "O"
table[2][7] = "O"
table[2][14] = "O"
#Print "#" in the 1st row 1st block
table[0][0] = "#"
#Print "H" in the 2nd row 1st block
table[1][0]="H"
#Print "C" in the 3rd row 1st block
table[2][0]="C"
#Assign column numbers to the first row of the table
for colum_num in range(1, 21):
   table[0][colum_num] = str(colum_num)

print("\t\t\t\t! Let's Roll The Dice & See What Luck Has In Store For You !")

#Continue playing until one of the players reaches or exceeds the block of 20
while players_location<20 and computers_location<20:
#Show the player's location on the table only if they have entered the game
   if players_location>=1:
       table[1][players_location] = "X"
#Show the computer's  location on the table only if it has entered the game
   if computers_location>=1:
       table[2][computers_location ] = "X"
#Show the game board after each dice roll
   if dice_value>=1:
      time.sleep(2)
      print()
      for row in table:
         print(" ","|", end="")
         for perblock in row:
            print("{:<2}".format(perblock), end="|")
         print()
      print()
      print("--------------------------------------------------------------------------")
   print()
```

Figure 4:3.1- Problem 1- Correct code

3.2. Problem 2- Human Player’s Pawn not disappearing from the previous position after moving



```
>> Pavith It's Your Turn..

        << Press Enter To Roll The Dice >>

        > You Rolled: 1
        > You Didn't Move..

>> Now Computer's Turn..

        > Computer Rolled: 6
        > Computer Can Start The Game Now..

  |# |1 |2 |3 |4 |5 |6 |7 |8 |9 |10|11|12|13|14|15|16|17|18|19|20|
  |H |  |X |  |  |  |  |O |  |  |  |  |  |  |O |  |  |  |  |  |  |
  |C |  |  |  |  |  |  |O |  |  |  |  |  |  |O |  |  |  |  |  |  |

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>> Pavith It's Your Turn..

        << Press Enter To Roll The Dice >>

        > You Rolled: 4
        > Your Current Location Is: 4

>> Now Computer's Turn..

        > Computer Rolled: 1
        > Computer Didn't Move..

  |# |1 |2 |3 |4 |5 |6 |7 |8 |9 |10|11|12|13|14|15|16|17|18|19|20|
  |H |  |X |  |X |  |  |O |  |  |  |  |  |  |O |  |  |  |  |  |  |
  |C |  |  |  |  |  |  |O |  |  |  |  |  |  |O |  |  |  |  |  |  |

---------------------------------------------------------------------------
```
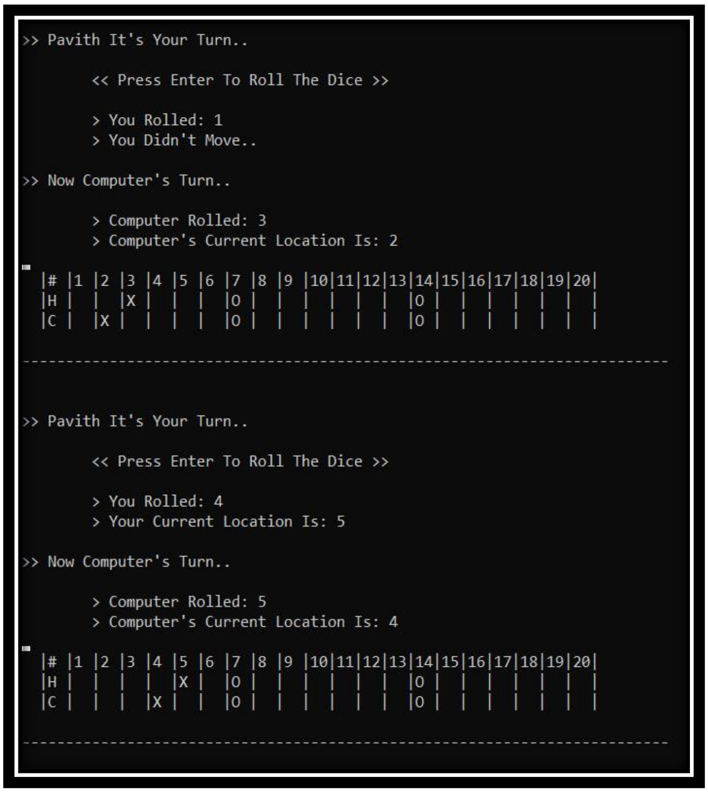
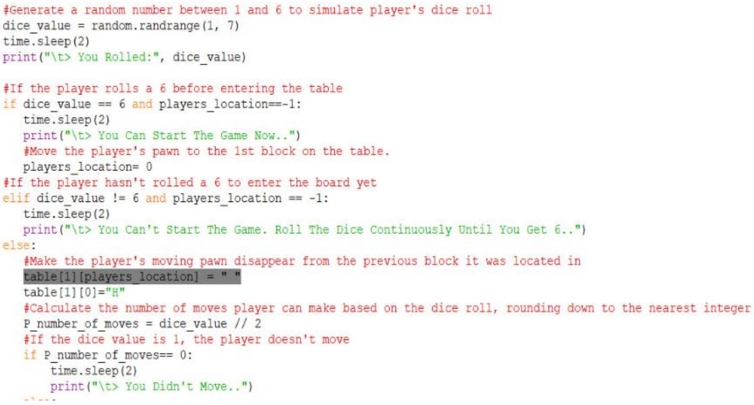

Figure 5:3.2- Problem 2- Incorrect output



```
>> Pavith It's Your Turn..

        << Press Enter To Roll The Dice >>

        > You Rolled: 1
        > You Didn't Move..

>> Now Computer's Turn..

        > Computer Rolled: 3
        > Computer's Current Location Is: 2

  |# |1 |2 |3 |4 |5 |6 |7 |8 |9 |10|11|12|13|14|15|16|17|18|19|20|
  |H |  |  |X |  |  |  |O |  |  |  |  |  |  |O |  |  |  |  |  |  |
  |C |  |X |  |  |  |  |O |  |  |  |  |  |  |O |  |  |  |  |  |  |

---------------------------------------------------------------------------


>> Pavith It's Your Turn..

        << Press Enter To Roll The Dice >>

        > You Rolled: 4
        > Your Current Location Is: 5

>> Now Computer's Turn..

        > Computer Rolled: 5
        > Computer's Current Location Is: 4

  |# |1 |2 |3 |4 |5 |6 |7 |8 |9 |10|11|12|13|14|15|16|17|18|19|20|
  |H |  |  |  |  |X |  |O |  |  |  |  |  |  |O |  |  |  |  |  |  |
  |C |  |  |  |X |  |  |O |  |  |  |  |  |  |O |  |  |  |  |  |  |

---------------------------------------------------------------------------
```

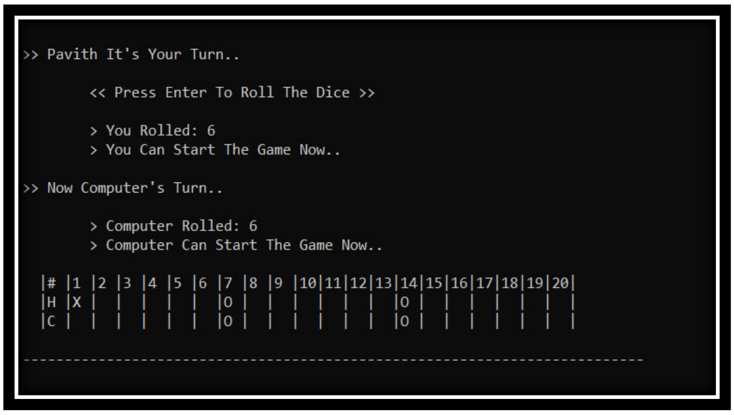
Figure 7:3.2- Problem 2- Correct output



```python
#Generate a random number between 1 and 6 to simulate player's dice roll
dice_value = random.randrange(1, 7)
time.sleep(2)
print("\t> You Rolled:", dice_value)

#If the player rolls a 6 before entering the table
if dice_value == 6 and players_location==-1:
    time.sleep(2)
    print("\t> You Can Start The Game Now..")
    #Move the player's pawn to the 1st block on the table.
    players_location= 0
#If the player hasn't rolled a 6 to enter the board yet
elif dice_value != 6 and players_location == -1:
    time.sleep(2)
    print("\t> You Can't Start The Game. Roll The Dice Continuously Until You Get 6..")
else:
    #Make the player's moving pawn disappear from the previous block it was located in
    table[1][players_location] = " "
    table[1][0]="H"
    #Calculate the number of moves player can make based on the dice roll, rounding down to the nearest integer
    P_number_of_moves = dice_value // 2
    #If the dice value is 1, the player doesn't move
    if P_number_of_moves== 0:
        time.sleep(2)
        print("\t> You Didn't Move..")
```

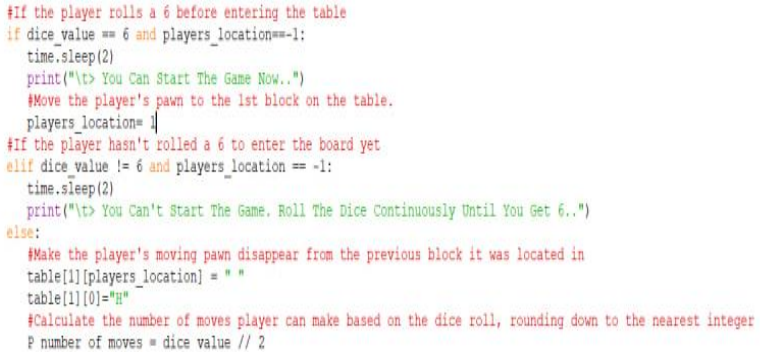
Figure 6:3.2- Problem 2- Correct code

3.3. Problem 3- Human player lands on block 1 when 6 appears in the dice before entering the game board



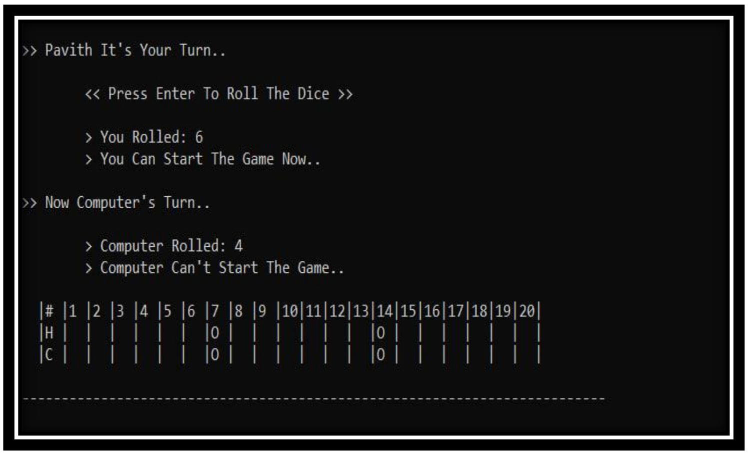
```
>> Pavith It's Your Turn..

        << Press Enter To Roll The Dice >>

        > You Rolled: 6
        > You Can Start The Game Now..

>> Now Computer's Turn..

        > Computer Rolled: 6
        > Computer Can Start The Game Now..

   |# |1 |2 |3 |4 |5 |6 |7 |8 |9 |10|11|12|13|14|15|16|17|18|19|20|
   |H |X |  |  |  |  |  |O |  |  |  |  |  |  |O |  |  |  |  |  |  |
   |C |  |  |  |  |  |  |O |  |  |  |  |  |  |O |  |  |  |  |  |  |

---------------------------------------------------------------------------
```

Figure 9:3.3- Problem 3- Incorrect output



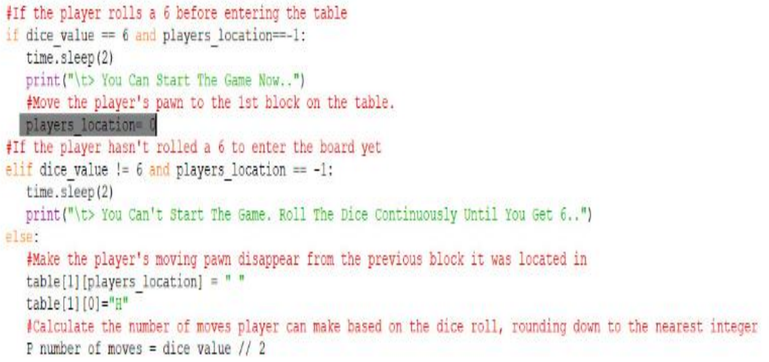
```python
#If the player rolls a 6 before entering the table
if dice_value == 6 and players_location==-1:
   time.sleep(2)
   print("\t> You Can Start The Game Now..")
   #Move the player's pawn to the 1st block on the table.
   players_location= 1
#If the player hasn't rolled a 6 to enter the board yet
elif dice_value != 6 and players_location == -1:
   time.sleep(2)
   print("\t> You Can't Start The Game. Roll The Dice Continuously Until You Get 6..")
else:
   #Make the player's moving pawn disappear from the previous block it was located in
   table[1][players_location] = " "
   table[1][0]="H"
   #Calculate the number of moves player can make based on the dice roll, rounding down to the nearest integer
   P number of moves = dice value // 2
```

Figure 8:3.3- Problem 3- Incorrect code



```
>> Pavith It's Your Turn..

        << Press Enter To Roll The Dice >>

        > You Rolled: 6
        > You Can Start The Game Now..

>> Now Computer's Turn..

        > Computer Rolled: 4
        > Computer Can't Start The Game..

   |# |1 |2 |3 |4 |5 |6 |7 |8 |9 |10|11|12|13|14|15|16|17|18|19|20|
   |H |  |  |  |  |  |  |O |  |  |  |  |  |  |O |  |  |  |  |  |  |
   |C |  |  |  |  |  |  |O |  |  |  |  |  |  |O |  |  |  |  |  |  |

---------------------------------------------------------------------------
```

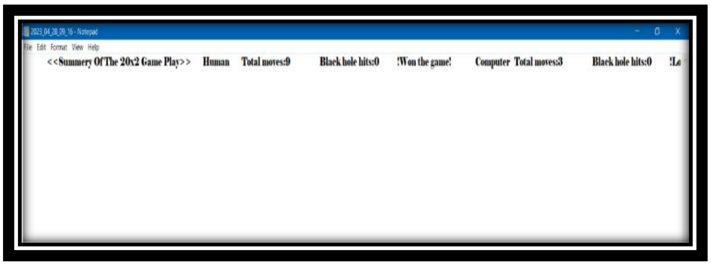
Figure 11:3.3- Problem 3- Correct output



```python
#If the player rolls a 6 before entering the table
if dice_value == 6 and players_location==-1:
   time.sleep(2)
   print("\t> You Can Start The Game Now..")
   #Move the player's pawn to the 1st block on the table.
   players_location= 0
#If the player hasn't rolled a 6 to enter the board yet
elif dice_value != 6 and players_location == -1:
   time.sleep(2)
   print("\t> You Can't Start The Game. Roll The Dice Continuously Until You Get 6..")
else:
   #Make the player's moving pawn disappear from the previous block it was located in
   table[1][players_location] = " "
   table[1][0]="H"
   #Calculate the number of moves player can make based on the dice roll, rounding down to the nearest integer
   P number of moves = dice value // 2
```

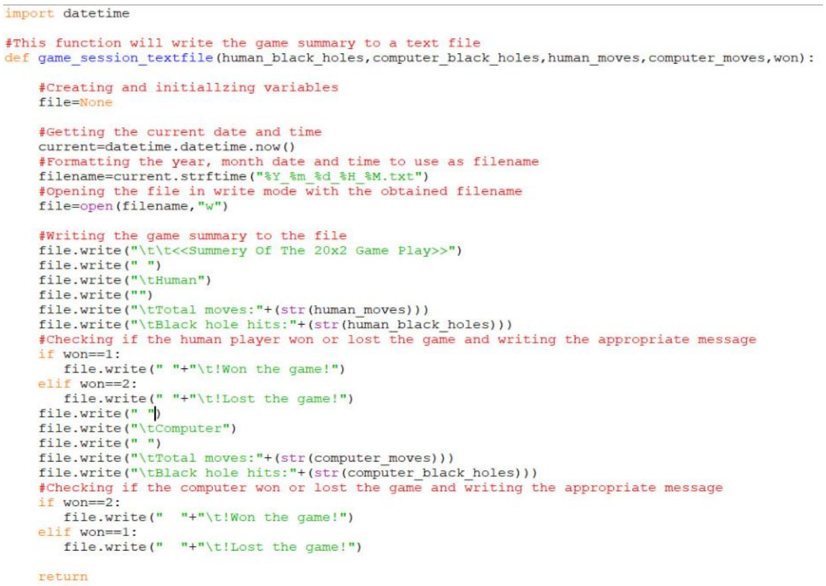
Figure 10:3.3- Problem 3- Correct code

3.4. Problem 4- Game summary not being saved properly in text file



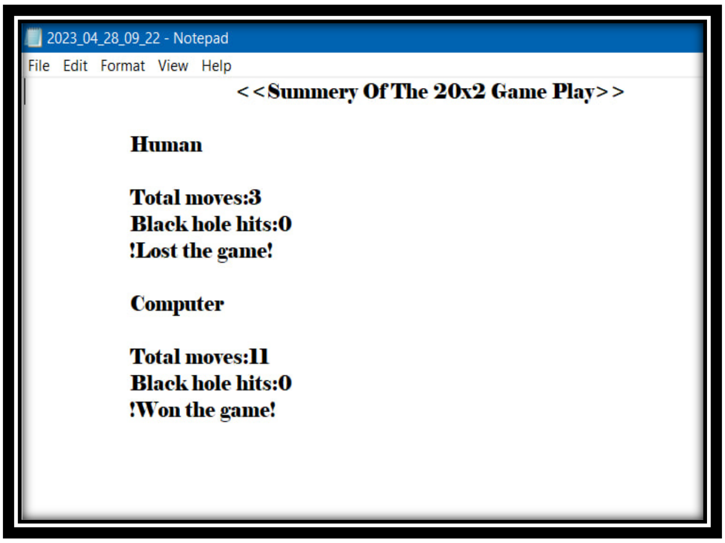
```
    <<Summery Of The 20x2 Game Play>>   Human   Total moves:9        Black hole hits:0    !Won the game!     Computer  Total moves:3        Black hole hits:0    !Lo
```

Figure 12:3.4- Problem 4- Incorrect output



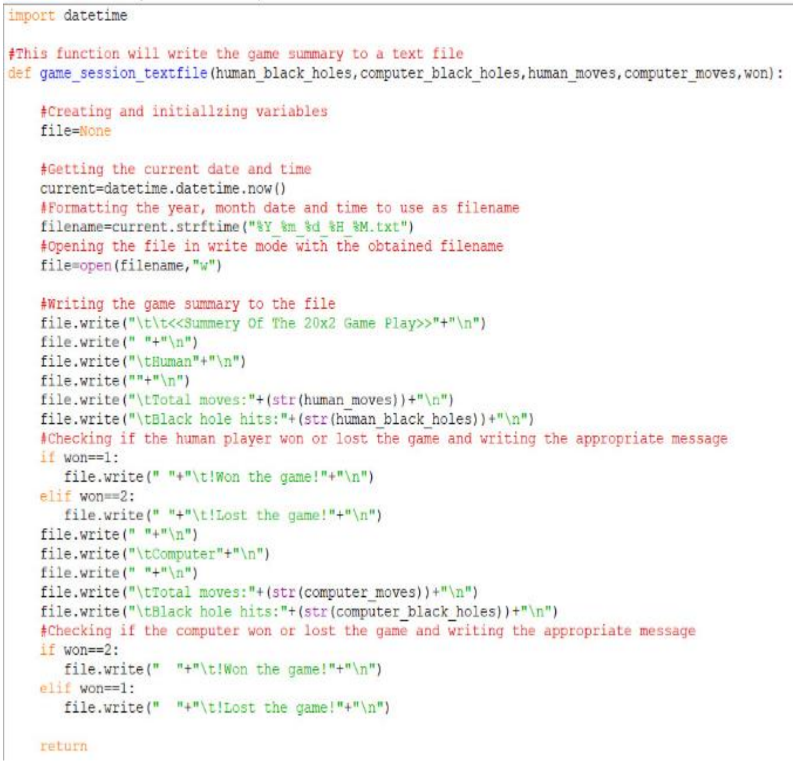
```python
import datetime

#This function will write the game summary to a text file
def game_session_textfile(human_black_holes,computer_black_holes,human_moves,computer_moves,won):

    #Creating and initiallzing variables
    file=None

    #Getting the current date and time
    current=datetime.datetime.now()
    #Formatting the year, month date and time to use as filename
    filename=current.strftime("%Y_%m_%d_%H_%M.txt")
    #Opening the file in write mode with the obtained filename
    file=open(filename,"w")

    #Writing the game summary to the file
    file.write("\t\t<<Summery Of The 20x2 Game Play>>")
    file.write(" ")
    file.write("\tHuman")
    file.write("")
    file.write("\tTotal moves:"+(str(human_moves)))
    file.write("\tBlack hole hits:"+(str(human_black_holes)))
    #Checking if the human player won or lost the game and writing the appropriate message
    if won==1:
        file.write(" "+"\t!Won the game!")
    elif won==2:
        file.write(" "+"\t!Lost the game!")
    file.write(" ")
    file.write("\tComputer")
    file.write(" ")
    file.write("\tTotal moves:"+(str(computer_moves)))
    file.write("\tBlack hole hits:"+(str(computer_black_holes)))
    #Checking if the computer won or lost the game and writing the appropriate message
    if won==2:
        file.write("  "+"\t!Won the game!")
    elif won==1:
        file.write("  "+"\t!Lost the game!")

    return
```

Figure 13:3.4- Problem 4- Incorrect code



```
                  <<Summery Of The 20x2 Game Play>>

        Human

        Total moves:3
        Black hole hits:0
        !Lost the game!

        Computer

        Total moves:11
        Black hole hits:0
        !Won the game!
```

Figure 15:3.4- Problem 4- Correct output



```python
import datetime

#This function will write the game summary to a text file
def game_session_textfile(human_black_holes,computer_black_holes,human_moves,computer_moves,won):

    #Creating and initiallzing variables
    file=None

    #Getting the current date and time
    current=datetime.datetime.now()
    #Formatting the year, month date and time to use as filename
    filename=current.strftime("%Y_%m_%d_%H_%M.txt")
    #Opening the file in write mode with the obtained filename
    file=open(filename,"w")

    #Writing the game summary to the file
    file.write("\t\t<<Summery Of The 20x2 Game Play>>"+"\n")
    file.write(" "+"\n")
    file.write("\tHuman"+"\n")
    file.write(""+"\n")
    file.write("\tTotal moves:"+(str(human_moves))+"\n")
    file.write("\tBlack hole hits:"+(str(human_black_holes))+"\n")
    #Checking if the human player won or lost the game and writing the appropriate message
    if won==1:
        file.write(" "+"\t!Won the game!"+"\n")
    elif won==2:
        file.write(" "+"\t!Lost the game!"+"\n")
    file.write(" "+"\n")
    file.write("\tComputer"+"\n")
    file.write(" "+"\n")
    file.write("\tTotal moves:"+(str(computer_moves))+"\n")
    file.write("\tBlack hole hits:"+(str(computer_black_holes))+"\n")
    #Checking if the computer won or lost the game and writing the appropriate message
    if won==2:
        file.write("  "+"\t!Won the game!"+"\n")
    elif won==1:
        file.write("  "+"\t!Lost the game!"+"\n")

    return
```

Figure 14:3.4- Problem 4- Correct code

4. All Python codes for building the "20 x 2” game

4.1. Main Program (20x2_Game)

```
#Creating and initializing variables
start_again=1
play_again=""
Pname=""
import time
#Calling "tableANDdiceroll" module as tdr
import tableANDdiceroll as tdr
print()
#Print welcome message to the player
print("\t\t\t\t\t\t\t... WELCOME TO 20x2 GAME...")
time.sleep(2)
print()
print()
#This is a while loop that will continue to run until the user enters their name
while not Pname:
    Pname=input("▲ Enter your name >> ")
    #Check if the user has entered a name or left it blank
    if not Pname:
        print()
        print(" ! Please Enter Your Name To Begin The Game !")
        print()
print()
print()
time.sleep(1)
#Print the instructions for playing the game
print("<< Instructions For Playing Game >>")
time.sleep(2)
print()
print()
print("1) The board has 20 blocks numbered 1 to 20 for both players.")
time.sleep(1)
print()
print("2) The other player is the computer.")
time.sleep(1)
print()
print("3) The first row of blocks is for the human player (\"H\"), while the second row is for the computer (\"C\").")
time.sleep(1)
print()
print("4) The game starts when a player rolls a 6 on the dice.")
time.sleep(1)
print()
print("5) Until a player rolls a 6, their pawn cannot enter the board.")
time.sleep(1)
print()
print("6) The player's moving pawn is represented by the letter \"X\".")
time.sleep(1)
```

```
print()
print("7) Both players have black holes on the board, located at block numbers \"7\" & \"14\".")
time.sleep(1)
print()
print("8) Black holes are denoted by the letter \"O\".")
time.sleep(1)
print()
print("9) If a player lands on a black hole, they must move back to block 1.")
time.sleep(1)
print()
print("10) If a player passes over a black hole without landing on it, there is no penalty.")
time.sleep(1)
print()
print("11) The number of blocks a player can move is equal to half of the dice value.")
print()
print("""\t*If you roll a 6, you can move 3 blocks.
\t*If you roll a 5, you can move 2 blocks (0.5 is neglected).
\t*If you roll a 1, you don't move at all.""")
time.sleep(1)
print()
print("12) The first player to reach or pass block 20 wins the game.")
time.sleep(1)
print()
print()
```

```
#Loop to allow the user to play the game again
while start_again==1:
    time.sleep(2)
  #Calling "table_diceRolls" function inside "tableANDdiceroll" module
    tdr.table_diceRolls(Pname)
    print()
    print()
  #Prompting the player to enter whether they want to play the game again or not
    time.sleep(2)
    print(">> Do you want to play again (Yes/No)?",end=" ")
    play_again=input("")
    print()
    print()
  #If the user enters "yes" or "Yes", the loop continues by assigning the value 1 to the "start_again" variable
    if(play_again=="yes" or play_again=="Yes"):
       start_again=1
  #Otherwise, the loop is exited by incrementing the "start_again" variable and using the "break" statement
    else:
        time.sleep(1)
        print("\t\t\t\t\tThank you for playing! We hope to see you again soon...")
        print()
        start_again+=1
        break
```

4.2. Module: “tableANDdiceroll”

4.2.1. Function: “table_diceRolls(Pname)”

```
#This function creates and runs 20x2 game

def table_diceRolls(Pname):

  #Creating and initiallzing variables

  human_moves = 0

  human_black_holes = 0

  computer_moves = 0

  computer_black_holes = 0

  dice_value=0

  computer_dice_value=0

  table= []

  players_location = -1

  computers_location = -1

  P_number_of_moves=0

  C_number_of_moves=0

  colum_num=0

  won=0

  import random

  import time

  #Calling game_summery module as gs

  import game_summery as gs

  #Calling game_session_textfile module as gst

  import game_session_textfile as gst
```

```
#Create game board(game table)
for i in range(3):
   row = [" "]*21
   table.append(row)
#Print "O" in specific positions in the table
table[1][7] = "O"
table[1][14] = "O"
table[2][7] = "O"
table[2][14] = "O"
#Print "#" in the 1st row 1st block
table[0][0] = "#"
#Print "H" in the 2nd row 1st block
table[1][0]="H"
#Print "C" in the 3rd row 1st block
table[2][0]="C"
#Assign column numbers to the first row of the table
for colum_num in range(1, 21):
   table[0][colum_num] = str(colum_num)
print("\t\t\t\t! Let's Roll The Dice & See What Luck Has In Store For You !")
#Continue playing until one of the players reaches or exceeds the block of 20
while players_location<20 and computers_location<20:
#Show the player's location on the table only if they have entered the game
   if players_location>=1:
     table[1][players_location] = "X"
#Show the computer's  location on the table only if it has entered the game
  if computers_location>=1:
     table[2][computers_location ] = "X"
#Show the game board after each dice roll
  if dice_value>=1:
    time.sleep(2)
    print()
    for row in table:
      print(" ","|", end="")
      for perblock in row:
        print("{:<2}".format(perblock), end="|")
      print()
    print()
    print("--------------------------------------------------------------------------")
  print()
  time.sleep(1)
#Player's turn to roll the dice
  print()
  print(">>",Pname,"It's Your Turn..")
  print()
  input("\t<< Press Enter To Roll The Dice >> ")
  print()
  #Generate a random number between 1 and 6 to simulate player's dice roll
    dice_value = random.randrange(1, 7)
    time.sleep(1)
    print("\t> You Rolled:", dice_value)


  #If the player rolls a 6 before entering the table
    if dice_value == 6 and players_location==-1:
      time.sleep(2)
      print("\t> You Can Start The Game Now..")
  #Move the player's pawn to the 1st block on the table.
      players_location= 0
  #If the player hasn't rolled a 6 to enter the board yet
    elif dice_value != 6 and players_location == -1:
      time.sleep(2)
      print("\t> You Can't Start The Game. Roll The Dice Continuously Until You Get 6..")
    else:
  #Make the player's moving pawn disappear from the previous block it was located in
      table[1][players_location] = " "
      table[1][0]="H"
  #Calculate the number of moves player can make based on the dice roll, rounding down to the nearest integer
      P_number_of_moves = dice_value // 2
  #If the dice value is 1, the player doesn't move
      if P_number_of_moves== 0:
        time.sleep(2)
        print("\t> You Didn't Move..")
    else:
#Determine player's new location on the table
        P_new_location = players_location + P_number_of_moves
#Determine the total number of moves player made
        human_moves+=1
#If the player's new location is equal to or greater than the 20th block, the player wins the game
        if P_new_location >=20:
          print()
          print()
          time.sleep(1)
          print("\t\t\t\t..Congratulations,",Pname,"!", "You Won The Game..")
#Assign 2 to won variable to use in "game_summery" and "game_session_textfile" modules
          won=1
          break
#If the player hits on a black hole
        elif P_new_location==7 or P_new_location==14:
          time.sleep(2)
          print("\t> Oh No! You Hit A Black Hole. Move Back To Block 1.")
          players_location = 1
#Calculate the player's total black hole hits
          human_black_holes += 1
#If the player moves on a regular block
        else:
            players_location = P_new_location
            time.sleep(2)
            print("\t> Your Current Location Is:",players_location)

#Generate a random number between 1 and 6 to simulate computers's dice roll
    computer_dice_value = random.randrange(1, 7)
    print()
    time.sleep(1)
    print(">> Now Computer's Turn..")
    print()
    time.sleep(2)
    print("\t> Computer Rolled:", computer_dice_value)

#If the computer rolls a 6 before entering the table
    if computer_dice_value==6 and computers_location==-1:
      time.sleep(2)
      print("\t> Computer Can Start The Game Now..")
#Move the computer's pawn to the 1st block on the table.
      computers_location=0
    elif computer_dice_value!= 6 and computers_location==-1:
      time.sleep(2)
      print("\t> Computer Can't Start The Game..")
    else:
#Make the computer's moving pawn disappear from the previous block it was located in
```

```
        table[2][computers_location]= " "
        table[2][0]="C"
  #Calculate the number of moves computer can make based on the dice roll, rounding down to the nearest integer
        C_number_of_moves=computer_dice_value//2
  #If the dice value is 1, the computer doesn't move
        if C_number_of_moves==0:
           time.sleep(2)
           print("\t> Computer Didn't Move..")
        else:
  #Determine computer's new location on the table
          new_location = computers_location + C_number_of_moves
  #Determine the total number of moves computer made
          computer_moves+=1
  #If the computer's new location is equal to or greater than the 20th block, the computer wins the game
          if new_location>=20:
             time.sleep(1)
             print()
             print()
             print("\t\t\t\t Computer Won The Game!!")
             print()
             print("\t\t Unfortunately, You Didn't Win This Time. Better Luck Next Time",Pname,"!!!")
  #Assign 2 to won variable to use in "game_summery" and "game_session_textfile" modules
```

```
            won=2
            break
  #If the computer hits on a black hole
          elif new_location== 7 or new_location == 14:
            print("\t> Oh No!The Computer Hit A Black Hole. Move Back To Block 1.")
            computers_location  = 1
  #Calculate the computer's total black hole hits
            computer_black_holes += 1
  #If the player moves on a regular block
          else:
            computers_location  = new_location
            time.sleep(2)
            print("\t> Computer's Current Location Is:", computers_location)
   print()
   time.sleep(2)
  #Calling "game_summery" function inside "game_summery" module

gs.game_summery(human_black_holes,computer_black_holes,human_moves,computer_moves,won)
  #Calling "game_session_textfile" function inside "game_session_textfile" module

gst.game_session_textfile(human_black_holes,computer_black_holes,human_moves,computer_moves,won)
   return
```

4.3. Module: “game_summery”

4.3.1.Function:“game_summery(human_black_holes,computer_black_holes,human_moves,computer_moves,won)”

```
#This fuction prints out a summary of the game play including total moves made, black hole hits, and whether the player won or lost

def game_summery(human_black_holes,computer_black_holes,human_moves,computer_moves,won):

    print()

    print("\t\t--------------------------------------------------------------")

    print()

    print("\t\t\t\t**Summery Of The Game Play**")

    print()

    #Printing the summary of the human player's performance

    print("\t\t\t\tYOU")

    print()

    print("\t\t\t\tTotal moves:",human_moves)

    print("\t\t\t\tBlack hole hits:",human_black_holes)

    #Checking if the human player's won or lost the game and printing the appropriate message

    if won==1:

        print("\t\t\t\t!Won the game!")

    elif won==2:

        print("\t\t\t\t!Lost the game!")

    print()

    print()
```

```
#Printing the summary of the computer's performance
print("\t\t\t\tCOMPUTER")
print()
print("\t\t\t\tTotal moves:",computer_moves)
print("\t\t\t\tBlack hole hits:",computer_black_holes)
#Checking if the computer won or lost the game and printing the appropriate message
if won==2:
   print("\t\t\t\t!Won the game!")
   print("\t\t------------------------------------------------------------------")
elif won==1:
   print("\t\t\t\t!Lost the game!")
   print("\t\t------------------------------------------------------------------")


return
```

4.4. Module: “game_session_textfile”

4.4.1.Function:“game_session_textfile(human_black_holes,computer_black_holes,human_moves,computer_moves,won)”

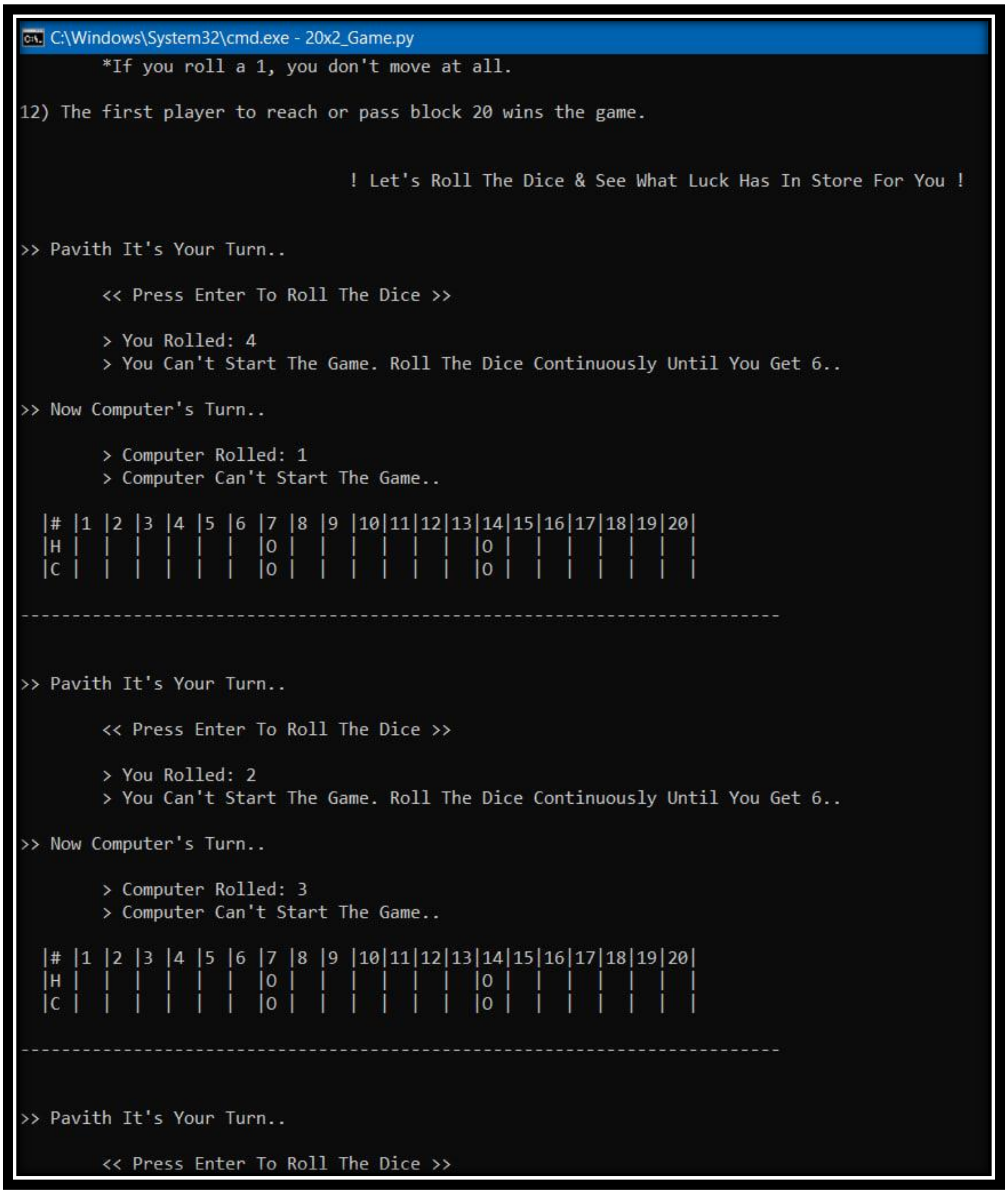
```
import datetime

#This function will write the game summary to a text file

def game_session_textfile(human_black_holes,computer_black_holes,human_moves,computer_moves,won):


    #Creating and initiallzing variables

    file=None


    #Getting the current date and time

    current=datetime.datetime.now()

    #Formatting the year, month date and time to use as filename

    filename=current.strftime("%Y_%m_%d_%H_%M.txt")

    #Opening the file in write mode with the obtained filename

    file=open(filename,"w")


    #Writing the game summary to the file

    file.write("\t\t<<Summery Of The 20x2 Game Play>>"+"\n")

    file.write(" "+"\n")

    file.write("\tHuman"+"\n")

    file.write(""+"\n")
file.write("\tTotal moves:"+(str(human_moves))+"\n")
file.write("\tBlack hole hits:"+(str(human_black_holes))+"\n")
#Checking if the human player won or lost the game and writing the appropriate message
if won==1:
  file.write(" "+"\t!Won the game!"+"\n")
elif won==2:
  file.write(" "+"\t!Lost the game!"+"\n")
file.write(" "+"\n")
file.write("\tComputer"+"\n")
file.write(" "+"\n")
file.write("\tTotal moves:"+(str(computer_moves))+"\n")
file.write("\tBlack hole hits:"+(str(computer_black_holes))+"\n")
#Checking if the computer won or lost the game and writing the appropriate message
if won==2:
  file.write("  "+"\t!Won the game!"+"\n")
elif won==1:
  file.write("  "+"\t!Lost the game!"+"\n")
return
```

5. Test cases

Test case	Expected Result	Actual Result	Pass/Fail
1. Human player rolls the dice and get a number that is not equal to 6 before entering the game board.	Display “You Can't Start The Game. Roll The Dice Continuously Until You Get 6.."	As expected	Pass
2. Computer rolls the dice and get a number that is not equal to 6 before entering the game board.	Display “Computer Can't Start The Game.."	As expected	Pass
3. Human player rolls the dice and get a 6 before entering the game board.	Display “You Can Start The Game Now.."	As expected	Pass
4. Computer rolls the dice and get a 6 before entering the game board.	Display “Computer Can Start The Game Now.."	As expected	Pass
5. After entering the game board human player rolls the dice and get a number greater than 1.	Human player's pawn moves on the board by half of the value on the rolled dice. Display “Your Current Location Is:"	As expected	Pass
6. After entering the game board computer rolls the dice and get a number greater than 1.	Computer's pawn moves on the board by half of the value on the rolled dice. Display “Computer's Current Location Is:"	As expected	Pass
7. Human player lands on a black hole.	Human player's pawn moves back to the 1st block Display “Oh No! You Hit A Black Hole. Move Back To Block 1.”	As expected	Pass

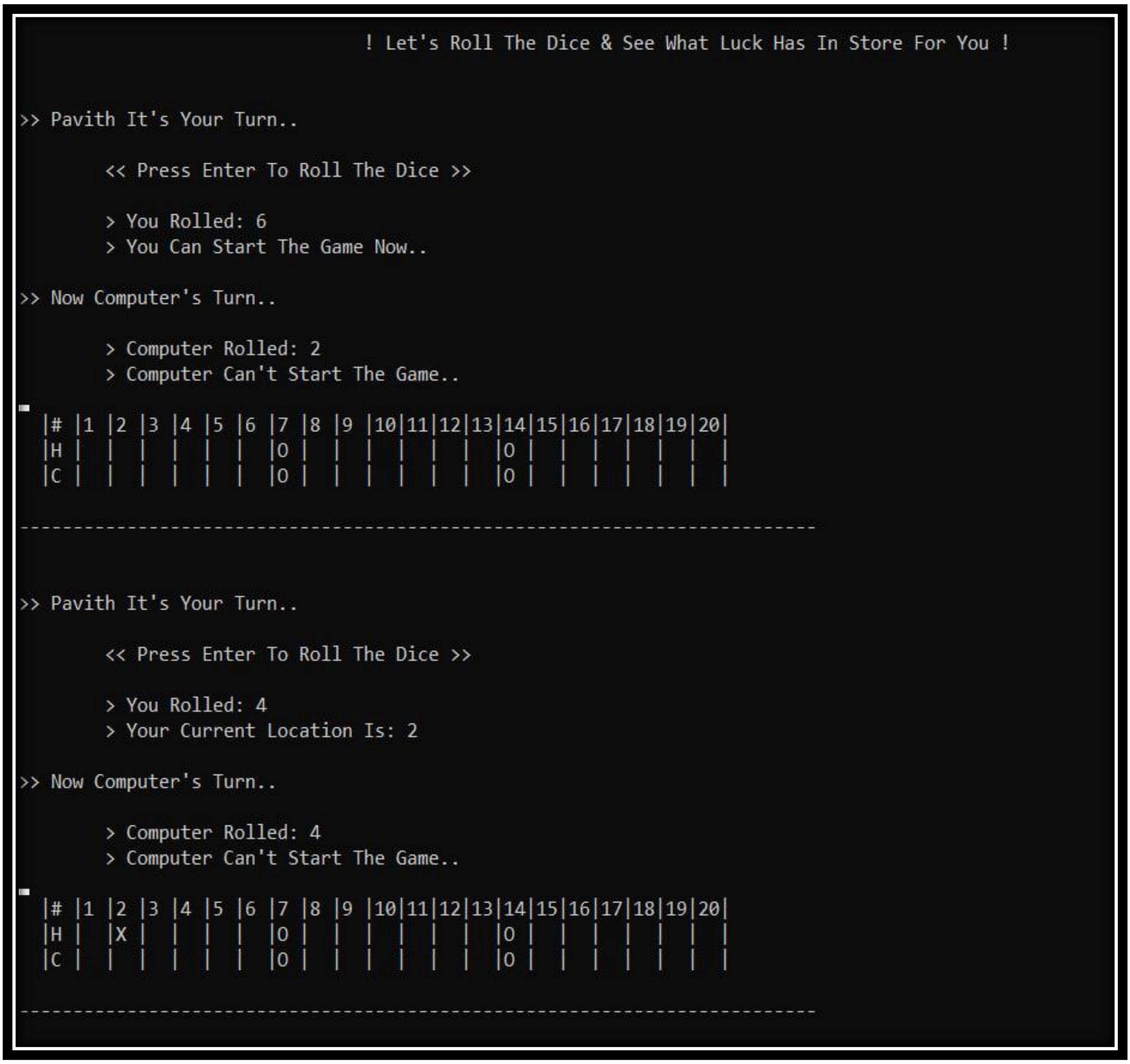
8. Computer lands on a black hole.	Computer's pawn moves back to the 1st block Display “Oh No! The Computer Hit A Black Hole. Move Back To Block 1."	As expected	Pass
9. Human player wins the game.	Display “Congratulations player’s name! You Won The Game.." Display summery of the game. Ask player want to play again or not.	As expected	Pass
10. Computer wins the game.	Display “Computer Won The Game!!" Display “Unfortunately, You Didn't Win This Time. Better Luck Next Time" Display summery of the game Ask whether player want to play again or not.	As expected	Pass
11. Calculate the number of black hole hits and total moves made by computer and human player in a game session individually.	After a game session display total number of moves and black hole hits in the summery of the game for human player and computer.	As expected	Pass
12. Verify that the game session text file is generated and contains the correct information.	After a game session is completed, the program should create a text file with a time-stamped	As expected	Pass

	name to uniquely identify the session. The game session summery text file should contain important details such as the total number of moves and black hole hits for each player, as well as whether the player won or lost. Each game session summery is being saved separately.		
13. Check if the game can be played multiple times by choosing to play again.	The program should start a new game session when the player enters "yes" or "Yes" for the message ">> Do you want to play again (Yes/No)?"	As expected	Pass
14. Check if the program allows the user to exit the game after end of the game session.	Display “Thank you for playing! We hope to see you again soon...” The game session should be terminated and the program should exit without errors when the player doesn’t enters "yes" or "Yes" for the message ">> Do you want to play again (Yes/No)?"	As expected	Pass



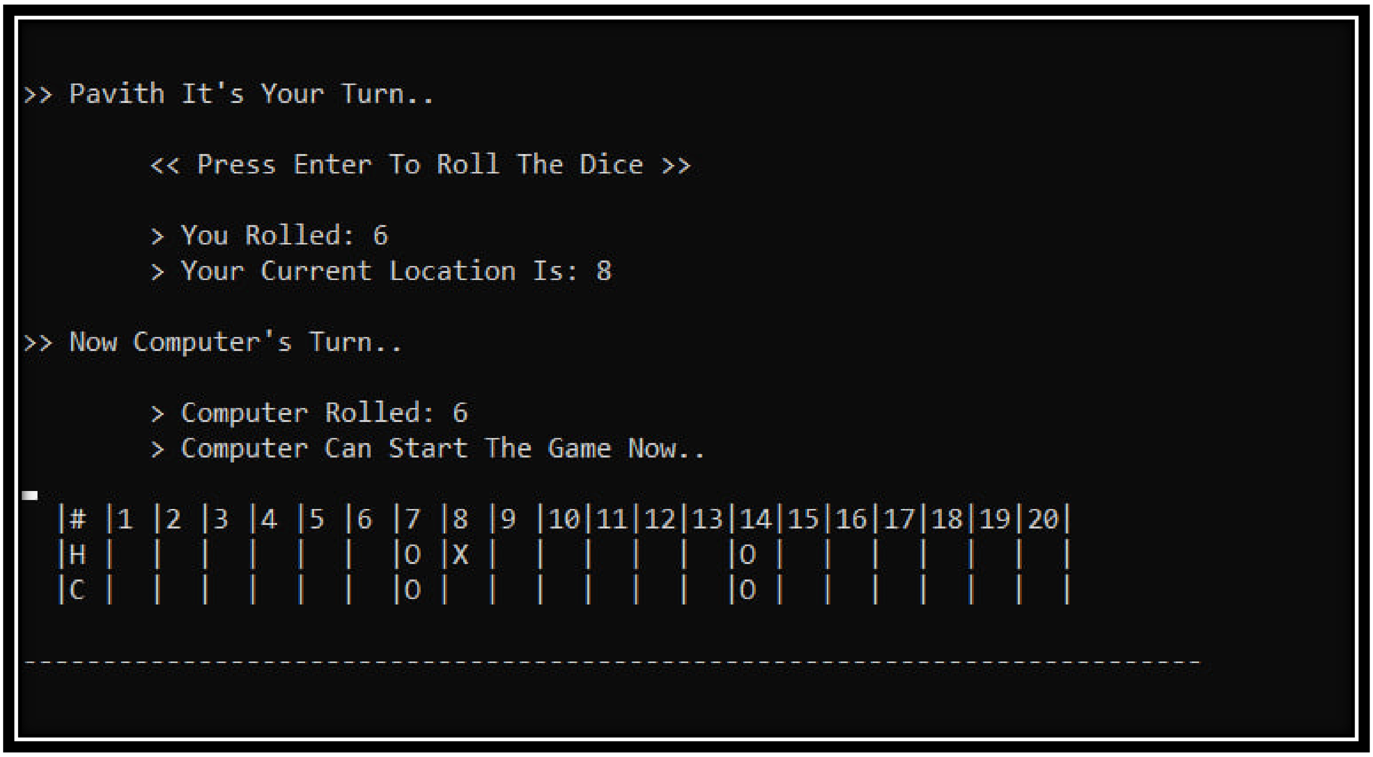
```
        *If you roll a 1, you don't move at all.

12) The first player to reach or pass block 20 wins the game.


                                ! Let's Roll The Dice & See What Luck Has In Store For You !


>> Pavith It's Your Turn..

        << Press Enter To Roll The Dice >>

        > You Rolled: 4
        > You Can't Start The Game. Roll The Dice Continuously Until You Get 6..

>> Now Computer's Turn..

        > Computer Rolled: 1
        > Computer Can't Start The Game..

  |# |1 |2 |3 |4 |5 |6 |7 |8 |9 |10|11|12|13|14|15|16|17|18|19|20|
  |H |  |  |  |  |  |  |O |  |  |  |  |  |  |O |  |  |  |  |  |  |
  |C |  |  |  |  |  |  |O |  |  |  |  |  |  |O |  |  |  |  |  |  |

--------------------------------------------------------------------------


>> Pavith It's Your Turn..

        << Press Enter To Roll The Dice >>

        > You Rolled: 2
        > You Can't Start The Game. Roll The Dice Continuously Until You Get 6..

>> Now Computer's Turn..

        > Computer Rolled: 3
        > Computer Can't Start The Game..

  |# |1 |2 |3 |4 |5 |6 |7 |8 |9 |10|11|12|13|14|15|16|17|18|19|20|
  |H |  |  |  |  |  |  |O |  |  |  |  |  |  |O |  |  |  |  |  |  |
  |C |  |  |  |  |  |  |O |  |  |  |  |  |  |O |  |  |  |  |  |  |

--------------------------------------------------------------------------


>> Pavith It's Your Turn..

        << Press Enter To Roll The Dice >>
```

Figure 16:5-Test case 1 and 2



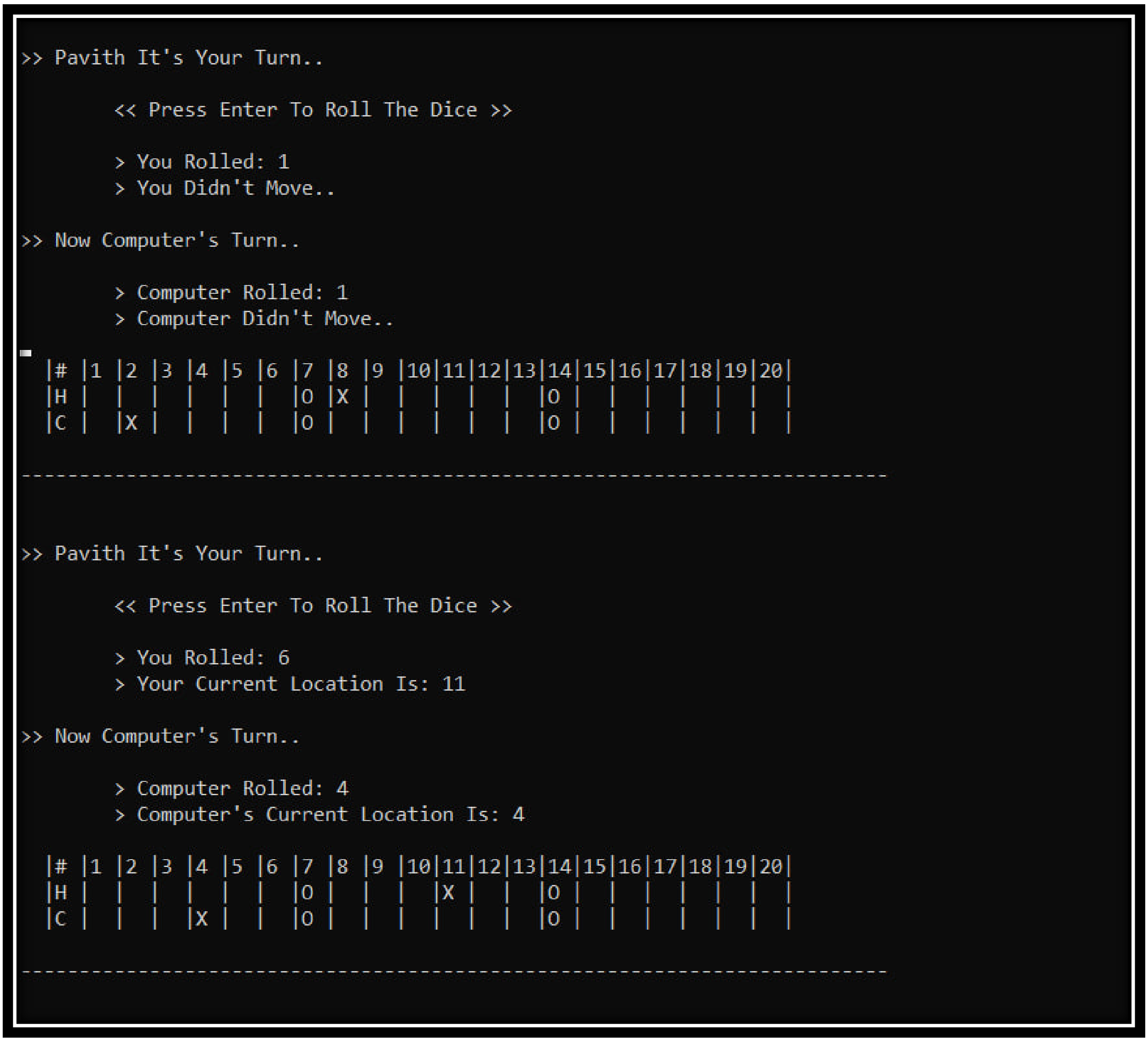
```
                                ! Let's Roll The Dice & See What Luck Has In Store For You !


>> Pavith It's Your Turn..

        << Press Enter To Roll The Dice >>

        > You Rolled: 6
        > You Can Start The Game Now..

>> Now Computer's Turn..

        > Computer Rolled: 2
        > Computer Can't Start The Game..

  |# |1 |2 |3 |4 |5 |6 |7 |8 |9 |10|11|12|13|14|15|16|17|18|19|20|
  |H |  |  |  |  |  |  |O |  |  |  |  |  |  |O |  |  |  |  |  |  |
  |C |  |  |  |  |  |  |O |  |  |  |  |  |  |O |  |  |  |  |  |  |

--------------------------------------------------------------------------


>> Pavith It's Your Turn..

        << Press Enter To Roll The Dice >>

        > You Rolled: 4
        > Your Current Location Is: 2

>> Now Computer's Turn..

        > Computer Rolled: 4
        > Computer Can't Start The Game..

  |# |1 |2 |3 |4 |5 |6 |7 |8 |9 |10|11|12|13|14|15|16|17|18|19|20|
  |H |  |X |  |  |  |  |O |  |  |  |  |  |  |O |  |  |  |  |  |  |
  |C |  |  |  |  |  |  |O |  |  |  |  |  |  |O |  |  |  |  |  |  |

--------------------------------------------------------------------------
```

Figure 17:5- Test Case 3



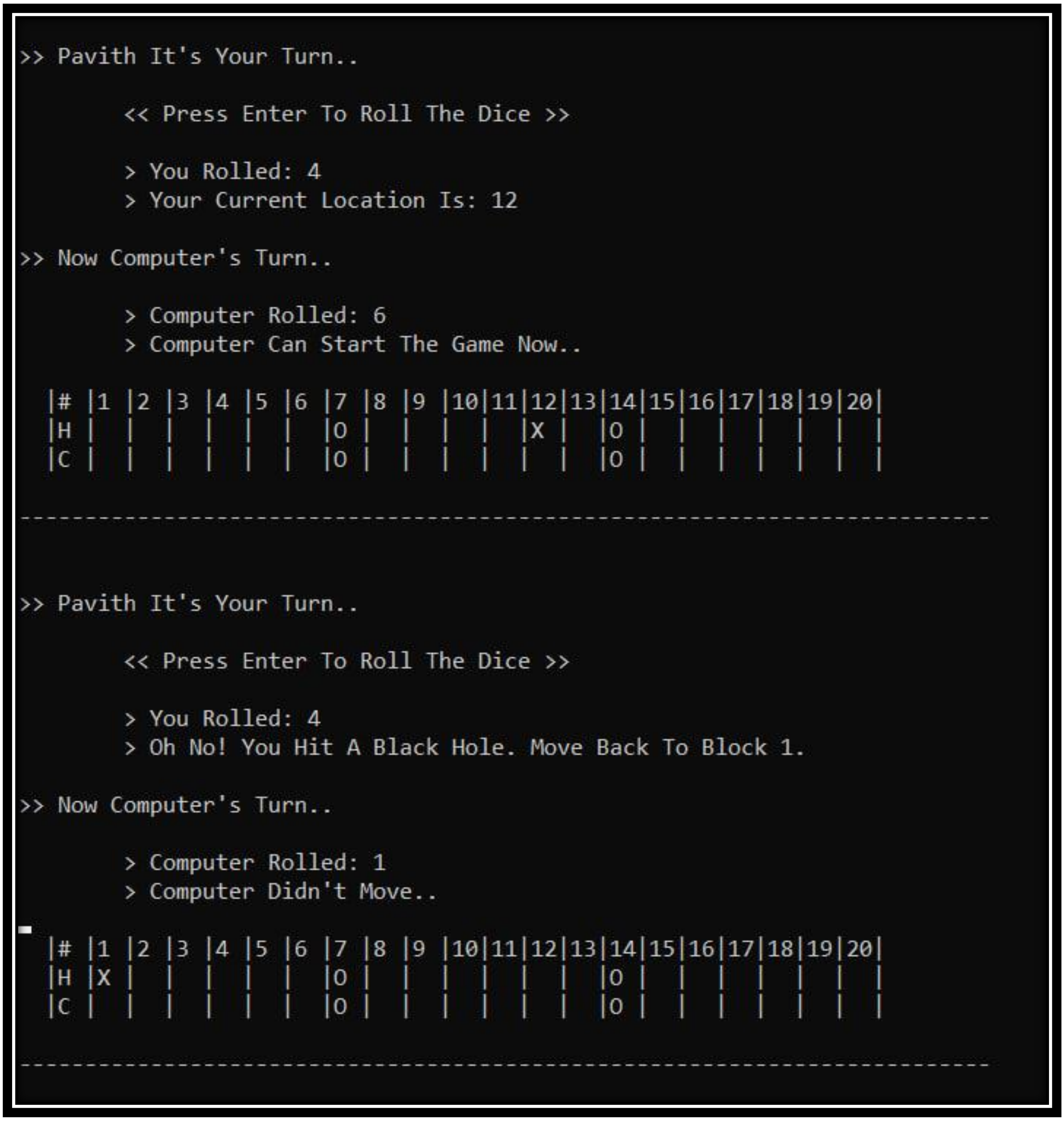
```
>> Pavith It's Your Turn..

        << Press Enter To Roll The Dice >>

        > You Rolled: 6
        > Your Current Location Is: 8

>> Now Computer's Turn..

        > Computer Rolled: 6
        > Computer Can Start The Game Now..

  |# |1 |2 |3 |4 |5 |6 |7 |8 |9 |10|11|12|13|14|15|16|17|18|19|20|
  |H |  |  |  |  |  |  |O |X |  |  |  |  |  |O |  |  |  |  |  |  |
  |C |  |  |  |  |  |  |O |  |  |  |  |  |  |O |  |  |  |  |  |  |

--------------------------------------------------------------------------
```

Figure 18:5- Test Case 4



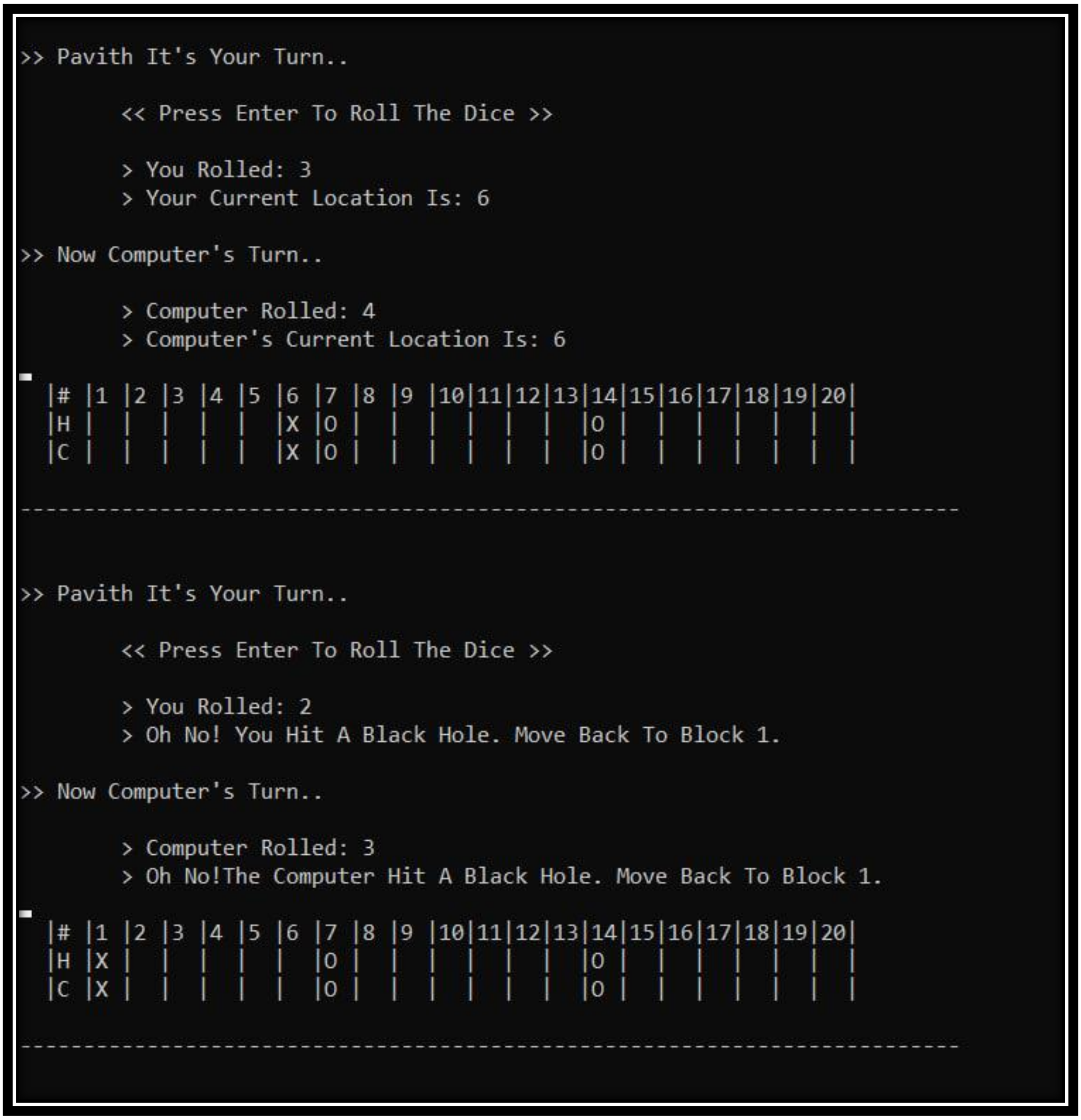
```
>> Pavith It's Your Turn..

        << Press Enter To Roll The Dice >>

        > You Rolled: 1
        > You Didn't Move..

>> Now Computer's Turn..

        > Computer Rolled: 1
        > Computer Didn't Move..

  |# |1 |2 |3 |4 |5 |6 |7 |8 |9 |10|11|12|13|14|15|16|17|18|19|20|
  |H |  |  |  |  |  |  |O |X |  |  |  |  |  |O |  |  |  |  |  |  |
  |C |  |X |  |  |  |  |O |  |  |  |  |  |  |O |  |  |  |  |  |  |

--------------------------------------------------------------------------


>> Pavith It's Your Turn..

        << Press Enter To Roll The Dice >>

        > You Rolled: 6
        > Your Current Location Is: 11

>> Now Computer's Turn..

        > Computer Rolled: 4
        > Computer's Current Location Is: 4

  |# |1 |2 |3 |4 |5 |6 |7 |8 |9 |10|11|12|13|14|15|16|17|18|19|20|
  |H |  |  |  |  |  |  |O |  |  |  |X |  |  |O |  |  |  |  |  |  |
  |C |  |  |  |X |  |  |O |  |  |  |  |  |  |O |  |  |  |  |  |  |

--------------------------------------------------------------------------
```

Figure 19:6- Test Case 5 and 6



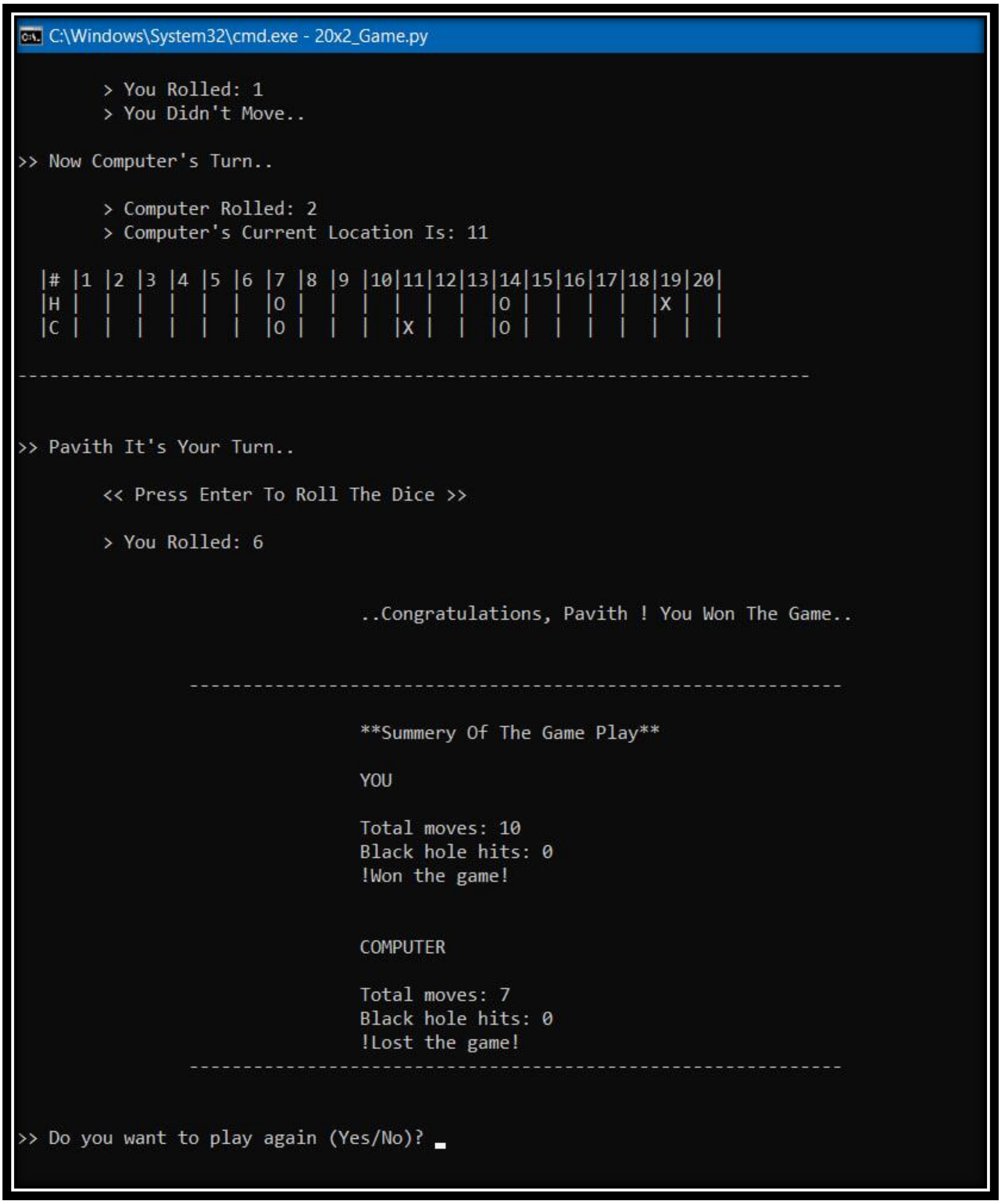
```
>> Pavith It's Your Turn..

       << Press Enter To Roll The Dice >>

       > You Rolled: 4
       > Your Current Location Is: 12

>> Now Computer's Turn..

       > Computer Rolled: 6
       > Computer Can Start The Game Now..

  |# |1 |2 |3 |4 |5 |6 |7 |8 |9 |10|11|12|13|14|15|16|17|18|19|20|
  |H |  |  |  |  |  |  |O |  |  |  |  |X |  |O |  |  |  |  |  |  |
  |C |  |  |  |  |  |  |O |  |  |  |  |  |  |O |  |  |  |  |  |  |

--------------------------------------------------------------------------


>> Pavith It's Your Turn..

       << Press Enter To Roll The Dice >>

       > You Rolled: 4
       > Oh No! You Hit A Black Hole. Move Back To Block 1.

>> Now Computer's Turn..

       > Computer Rolled: 1
       > Computer Didn't Move..

  |# |1 |2 |3 |4 |5 |6 |7 |8 |9 |10|11|12|13|14|15|16|17|18|19|20|
  |H |X |  |  |  |  |  |O |  |  |  |  |  |  |O |  |  |  |  |  |  |
  |C |  |  |  |  |  |  |O |  |  |  |  |  |  |O |  |  |  |  |  |  |

--------------------------------------------------------------------------
```

Figure 20:5- Test Case 7



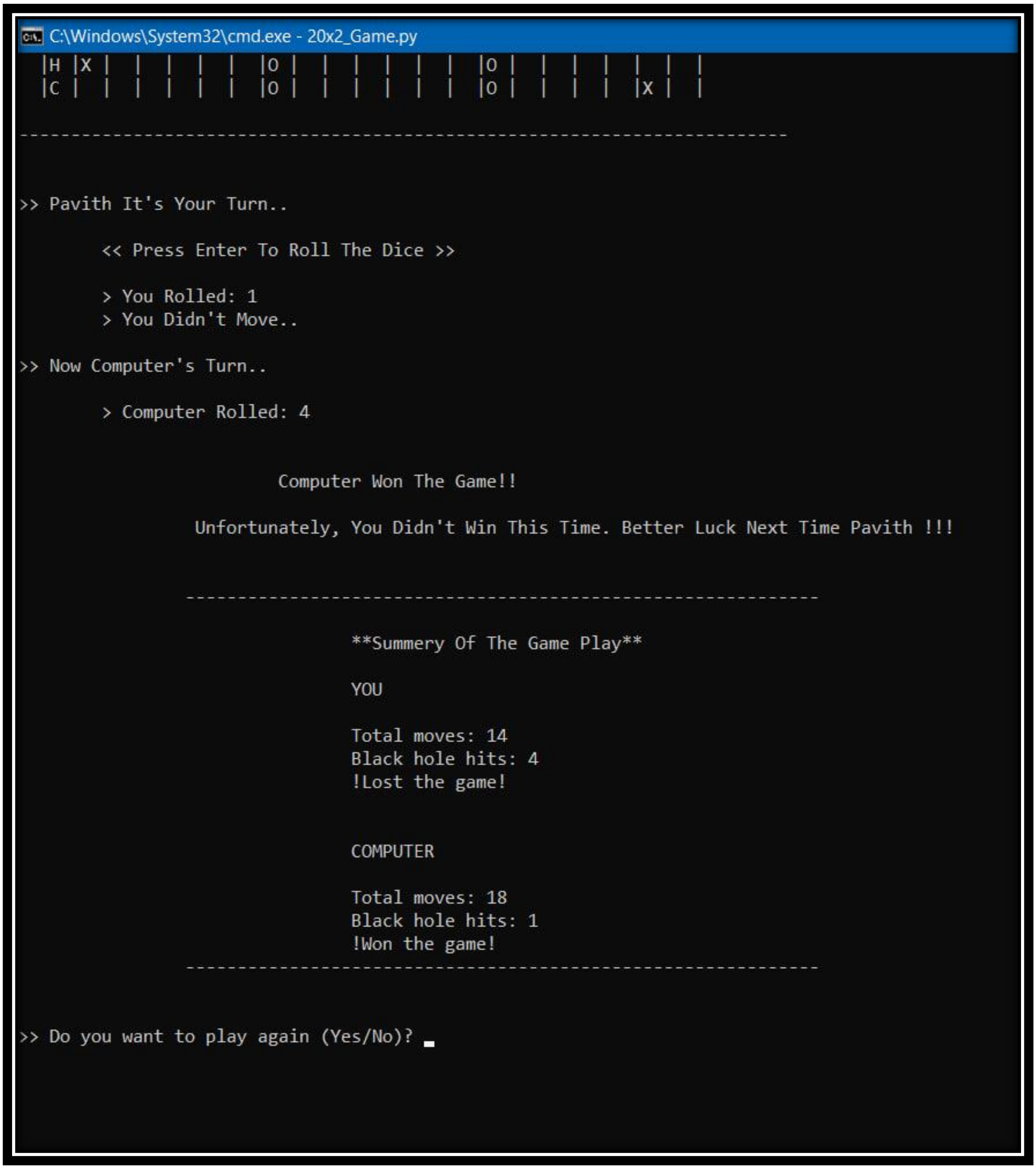
```
>> Pavith It's Your Turn..

        << Press Enter To Roll The Dice >>

        > You Rolled: 3
        > Your Current Location Is: 6

>> Now Computer's Turn..

        > Computer Rolled: 4
        > Computer's Current Location Is: 6

  |# |1 |2 |3 |4 |5 |6 |7 |8 |9 |10|11|12|13|14|15|16|17|18|19|20|
  |H |  |  |  |  |  |X |O |  |  |  |  |  |  |O |  |  |  |  |  |  |
  |C |  |  |  |  |  |X |O |  |  |  |  |  |  |O |  |  |  |  |  |  |

--------------------------------------------------------------------------


>> Pavith It's Your Turn..

        << Press Enter To Roll The Dice >>

        > You Rolled: 2
        > Oh No! You Hit A Black Hole. Move Back To Block 1.

>> Now Computer's Turn..

        > Computer Rolled: 3
        > Oh No!The Computer Hit A Black Hole. Move Back To Block 1.

  |# |1 |2 |3 |4 |5 |6 |7 |8 |9 |10|11|12|13|14|15|16|17|18|19|20|
  |H |X |  |  |  |  |  |O |  |  |  |  |  |  |O |  |  |  |  |  |  |
  |C |X |  |  |  |  |  |O |  |  |  |  |  |  |O |  |  |  |  |  |  |

--------------------------------------------------------------------------
```

Figure 21:5-Test Case 8



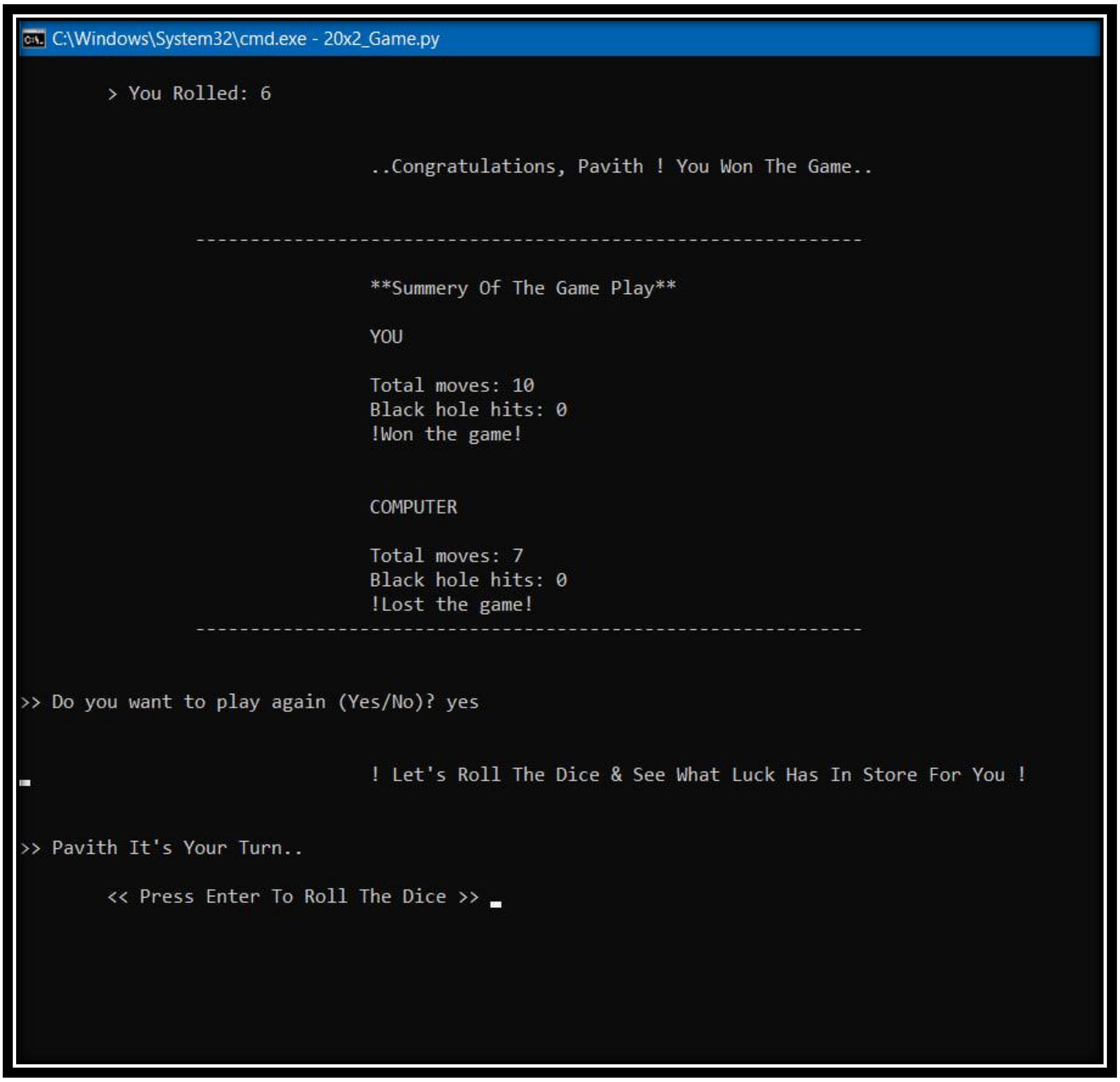
```
        > You Rolled: 1
        > You Didn't Move..

>> Now Computer's Turn..

        > Computer Rolled: 2
        > Computer's Current Location Is: 11

  |# |1 |2 |3 |4 |5 |6 |7 |8 |9 |10|11|12|13|14|15|16|17|18|19|20|
  |H |  |  |  |  |  |  |O |  |  |  |  |  |  |O |  |  |  |  |X |  |
  |C |  |  |  |  |  |  |O |  |  |  |X |  |  |O |  |  |  |  |  |  |

--------------------------------------------------------------------------


>> Pavith It's Your Turn..

        << Press Enter To Roll The Dice >>

        > You Rolled: 6


                                ..Congratulations, Pavith ! You Won The Game..


                ------------------------------------------------------------

                                **Summery Of The Game Play**

                                YOU

                                Total moves: 10
                                Black hole hits: 0
                                !Won the game!


                                COMPUTER

                                Total moves: 7
                                Black hole hits: 0
                                !Lost the game!
                ------------------------------------------------------------


>> Do you want to play again (Yes/No)? _
```

Figure 22:5- Test case 9



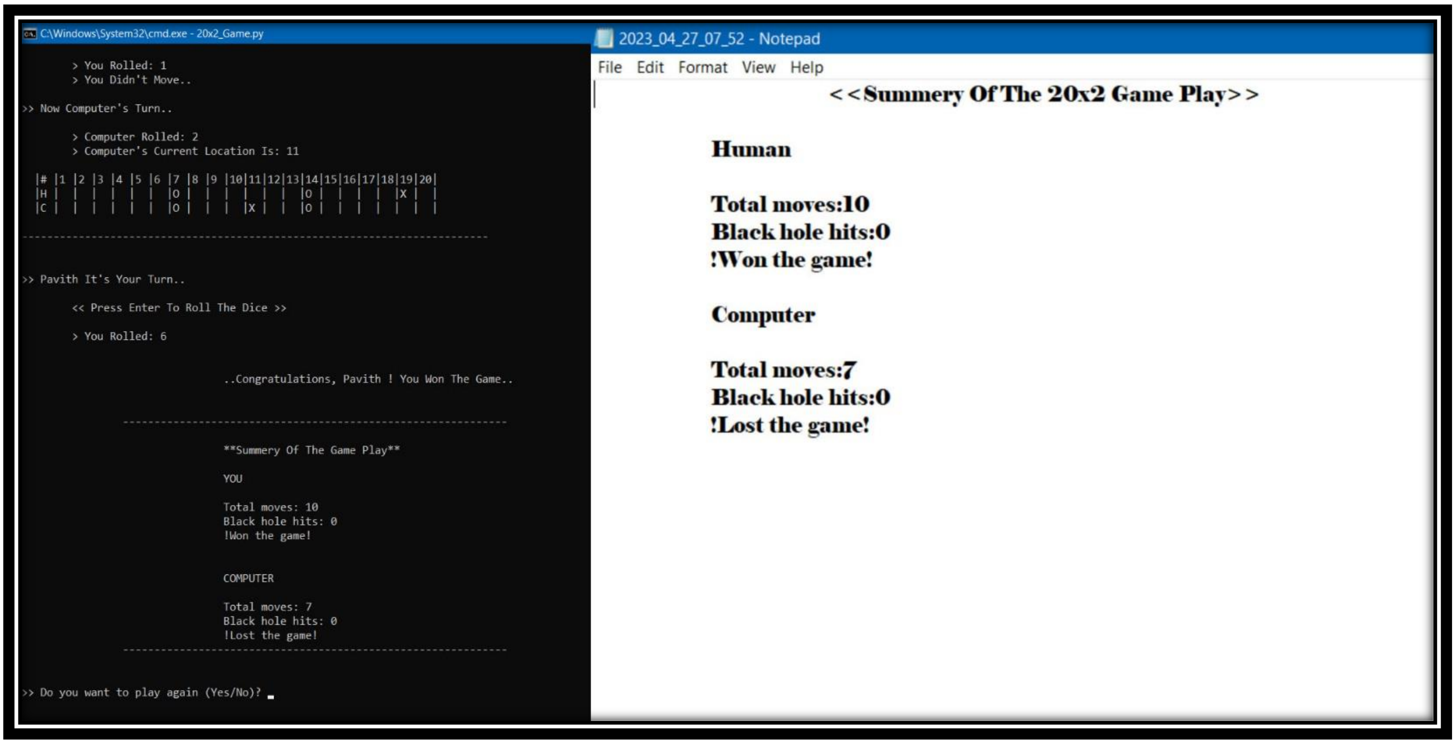
```
  |H |X |  |  |  |  |  |O |  |  |  |  |  |  |O |  |  |  |  |  |
  |C |  |  |  |  |  |  |O |  |  |  |  |  |  |O |  |  |  |  |X |  |

--------------------------------------------------------------------------


>> Pavith It's Your Turn..

        << Press Enter To Roll The Dice >>

        > You Rolled: 1
        > You Didn't Move..

>> Now Computer's Turn..

        > Computer Rolled: 4


                         Computer Won The Game!!

                 Unfortunately, You Didn't Win This Time. Better Luck Next Time Pavith !!!


                ------------------------------------------------------------

                                **Summery Of The Game Play**

                                YOU

                                Total moves: 14
                                Black hole hits: 4
                                !Lost the game!


                                COMPUTER

                                Total moves: 18
                                Black hole hits: 1
                                !Won the game!
                ------------------------------------------------------------


>> Do you want to play again (Yes/No)?
```

Figure 23:5- Test Case 10



```
        > You Rolled: 6


                                ..Congratulations, Pavith ! You Won The Game..


                ----------------------------------------------------------------

                                **Summery Of The Game Play**

                                YOU

                                Total moves: 10
                                Black hole hits: 0
                                !Won the game!


                                COMPUTER

                                Total moves: 7
                                Black hole hits: 0
                                !Lost the game!
                ----------------------------------------------------------------


>> Do you want to play again (Yes/No)? yes


                                ! Let's Roll The Dice & See What Luck Has In Store For You !


>> Pavith It's Your Turn..

        << Press Enter To Roll The Dice >>
```

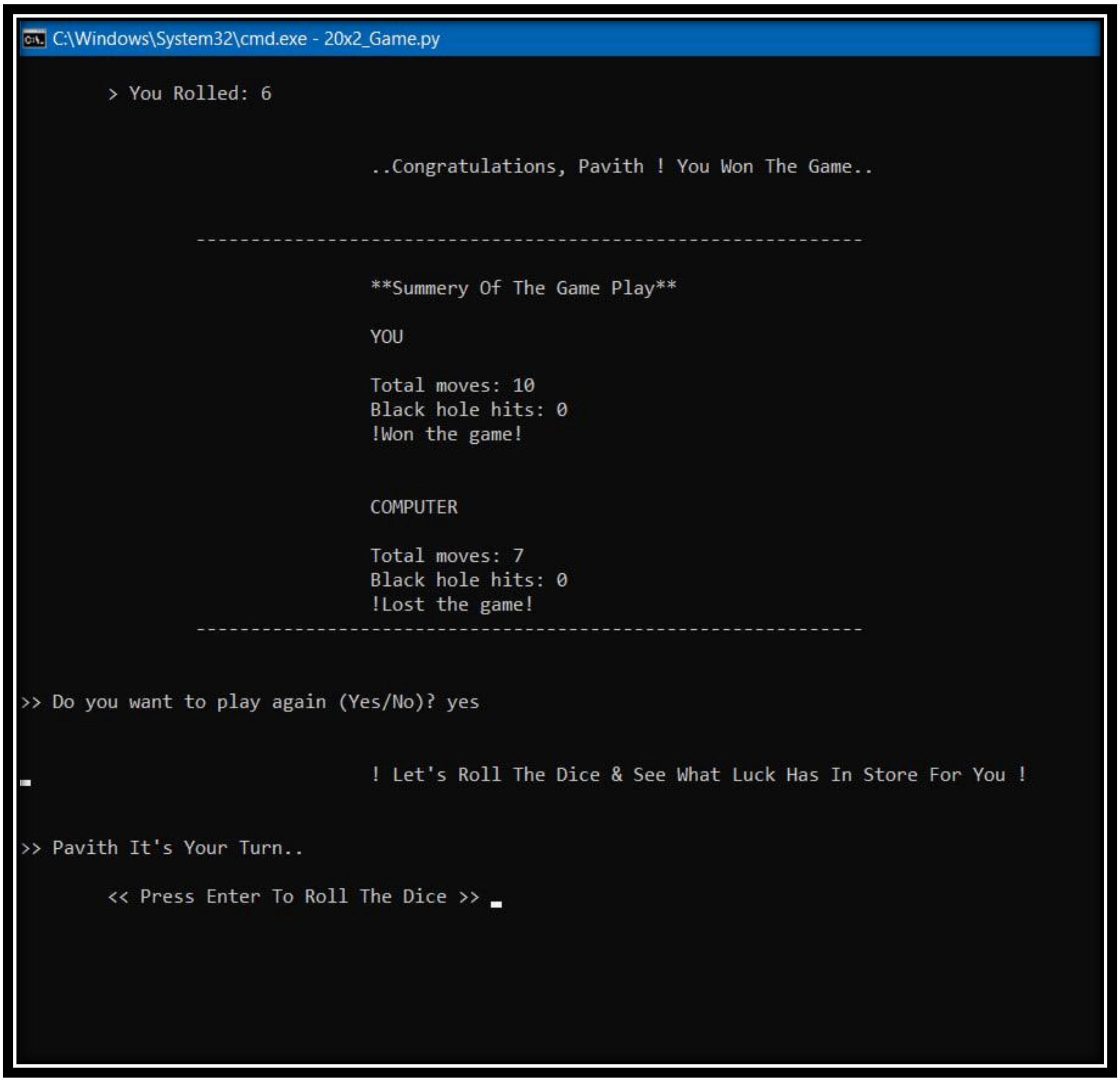
Figure 24:5- Test Case 11



```
        > You Rolled: 1
        > You Didn't Move..

>> Now Computer's Turn..

        > Computer Rolled: 2
        > Computer's Current Location Is: 11

  |# |1 |2 |3 |4 |5 |6 |7 |8 |9 |10|11|12|13|14|15|16|17|18|19|20|
  |H |  |  |  |  |  |  |O |  |  |  |  |  |  |O |  |  |  |  |X |  |
  |C |  |  |  |  |  |  |O |  |  |  |X |  |  |O |  |  |  |  |  |  |

---------------------------------------------------------------------------


>> Pavith It's Your Turn..

        << Press Enter To Roll The Dice >>

        > You Rolled: 6


                        ..Congratulations, Pavith ! You Won The Game..


                ---------------------------------------------------------------

                        **Summery Of The Game Play**

                        YOU

                        Total moves: 10
                        Black hole hits: 0
                        !Won the game!


                        COMPUTER

                        Total moves: 7
                        Black hole hits: 0
                        !Lost the game!
                ---------------------------------------------------------------


>> Do you want to play again (Yes/No)? _
```

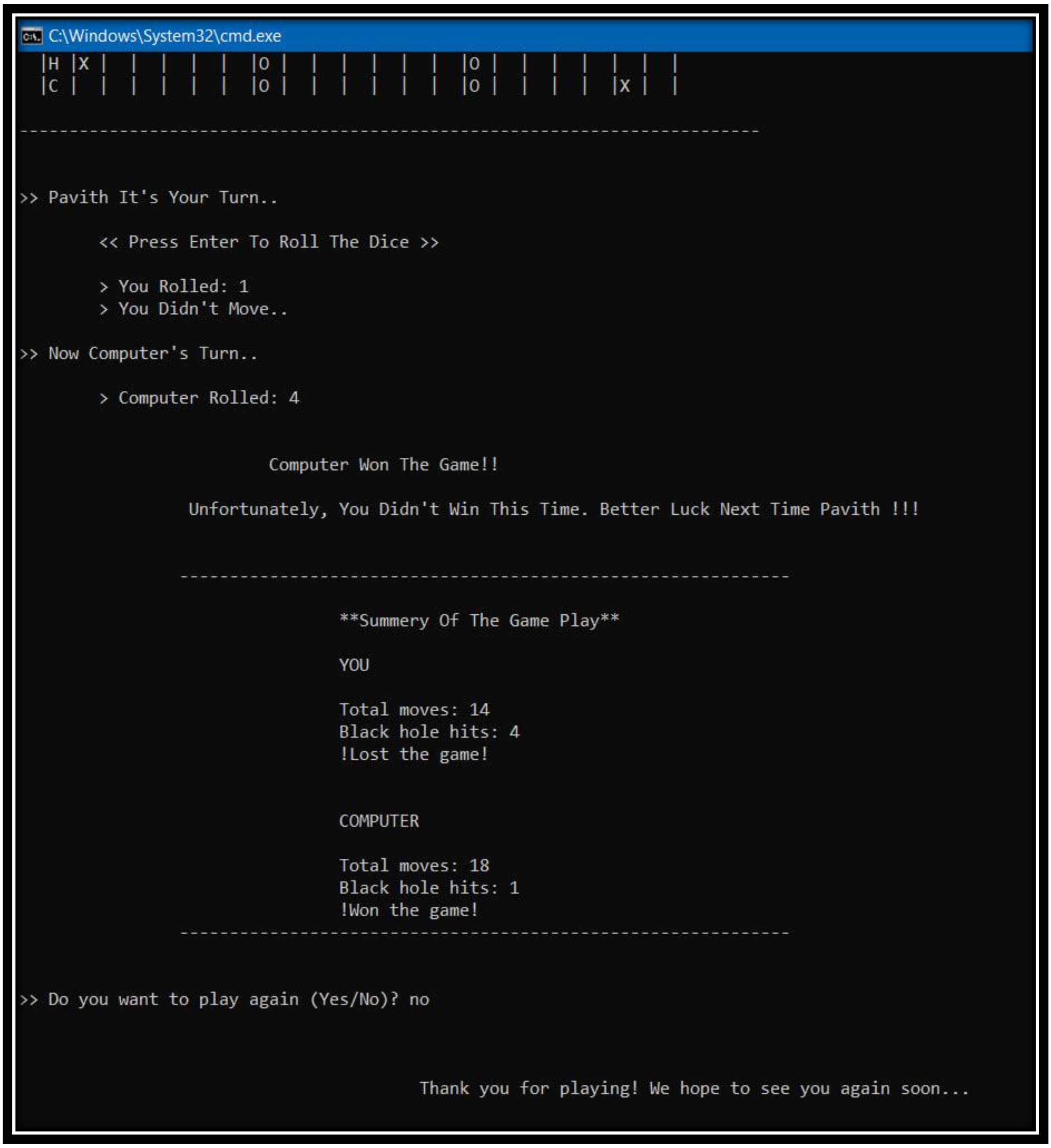
```
<<Summery Of The 20x2 Game Play>>

Human

Total moves:10
Black hole hits:0
!Won the game!

Computer

Total moves:7
Black hole hits:0
!Lost the game!
```

Figure 25:5- Test Case 12



```
        > You Rolled: 6


                                ..Congratulations, Pavith ! You Won The Game..


                ------------------------------------------------------------

                                **Summery Of The Game Play**

                                YOU

                                Total moves: 10
                                Black hole hits: 0
                                !Won the game!


                                COMPUTER

                                Total moves: 7
                                Black hole hits: 0
                                !Lost the game!
                ------------------------------------------------------------


>> Do you want to play again (Yes/No)? yes


                                ! Let's Roll The Dice & See What Luck Has In Store For You !


>> Pavith It's Your Turn..

        << Press Enter To Roll The Dice >> _
```

Figure 26:5- Test Case 13



```
  |H |X |  |  |  |  |  |O |  |  |  |  |  |  |O |  |  |  |  |  |  |
  |C |  |  |  |  |  |  |O |  |  |  |  |  |  |O |  |  |  |  |X |  |

-------------------------------------------------------------------------


>> Pavith It's Your Turn..

        << Press Enter To Roll The Dice >>

        > You Rolled: 1
        > You Didn't Move..

>> Now Computer's Turn..

        > Computer Rolled: 4


                         Computer Won The Game!!

                 Unfortunately, You Didn't Win This Time. Better Luck Next Time Pavith !!!


                ------------------------------------------------------------

                                **Summery Of The Game Play**

                                YOU

                                Total moves: 14
                                Black hole hits: 4
                                !Lost the game!


                                COMPUTER

                                Total moves: 18
                                Black hole hits: 1
                                !Won the game!
                ------------------------------------------------------------


>> Do you want to play again (Yes/No)? no


                                        Thank you for playing! We hope to see you again soon...
```

Figure 27:5- Test Case 14