Data Structures 1

Laboratory Exercise # 1

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CCS2104L

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Laboratory Hands on #1

Objective(s)

1. To create a simple python program exhibiting python programming construct.
2. Demonstrate a running program based on the given program requirements.
3. Identify the different programming constructs present within the program.
4. Run and explain the program.

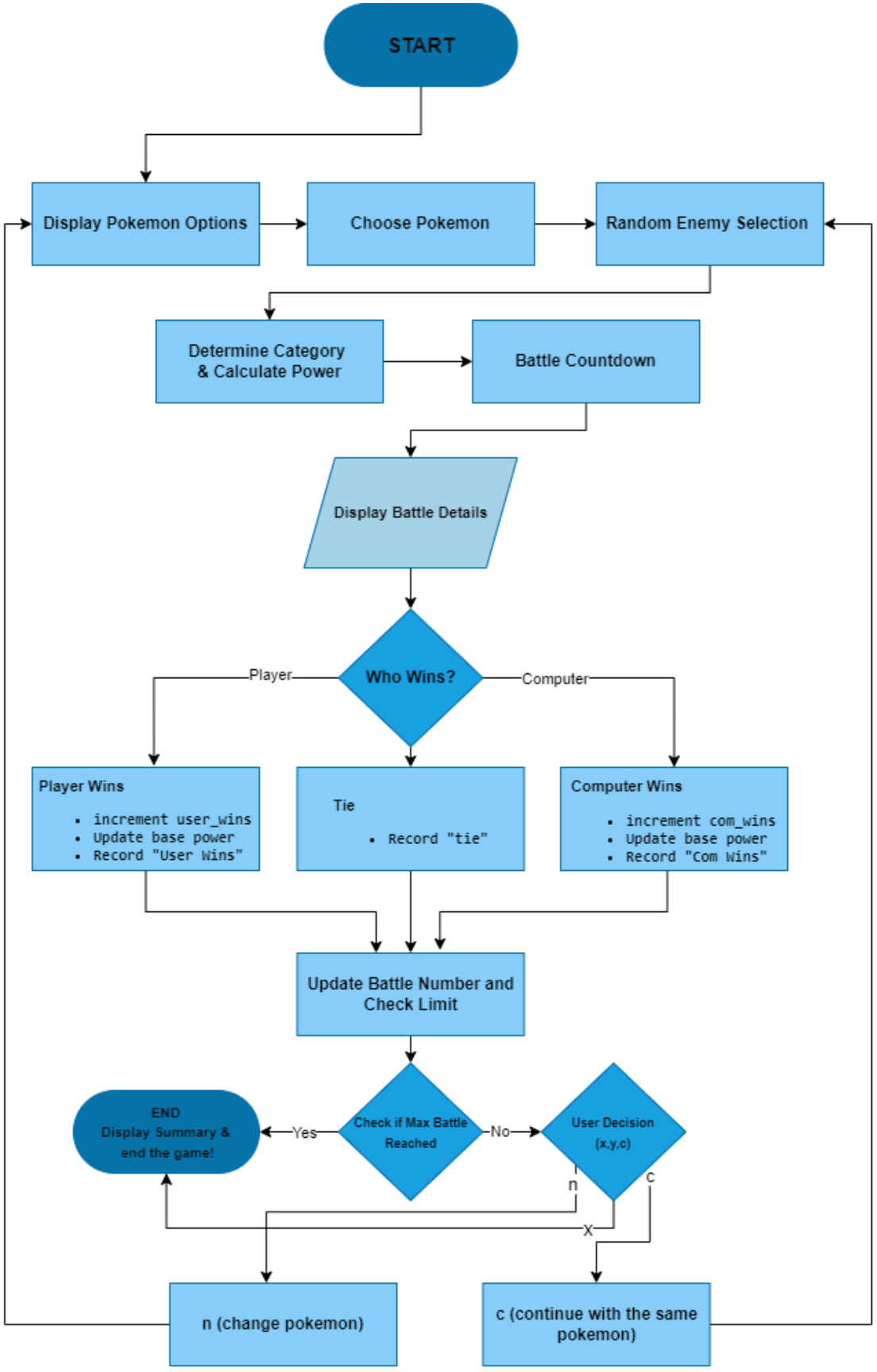
Program

Create a simple python program that simulates a battle between a user-selected Pokémon character and a computer-generated Pokémon opponent. The program will allow the end-user to select a character, and engage in battles against a computer. If the end-user wins the battle, power increases by the amount of the opponent's power. The battle continues until the user decides to exit by pressing the 'x' button or entering any character to top the game.

Algorithm

1. Start
2. Initialize pokemon data for both the player and the computer by defining their respective pokemon and base powers.
3. Next, initialize necessary counters and limits, including variables to track the number of wins, battles, and pokemon changes, as well as limits on the number of pokemon changes and battles.
4. Battle loop
    - 1.1 Choose Pokemon : Display the available options and prompt the user to choose one.
    - 1.2 Generate Enemy: Randomly select an enemy pokemon and determine its power by calculating its base power and it's category.
    - 1.3 Calculate Powers: Compute and display the power of both the player's and the enemy's pokemon, including their base and additional powers.
    - 1.4 Determine Winner: Compare the powers of the player's and enemy's pokemon, update the scores based on the outcome, and record the results.
    - 1.5 User Choice: Prompt the user to decide whether to continue battling with the current pokemon, switch to a new Pokémon (if allowed), or exit the game.
2. Based on the battle outcome (win, lose, or tie), update the base powers of the Pokémon.
3. Record the results of the battle in battle_summary.
4. Ask the user if they want to continue battling, choose a new pokemon (if within the limit), or exit the game.
5. Display results and battle summary.
6. Stop

Flowchart


START
Display Pokemon Options
Choose Pokemon
Random Enemy Selection
Determine Category & Calculate Power
Battle Countdown
Display Battle Details
Who Wins?
Player
Computer
Player Wins
increment user_wins
Update base power
Record "User Wins"
Tie
Record "tie"
Computer Wins
increment com_wins
Update base power
Record "Com Wins"
Update Battle Number and Check Limit
Check if Max Battle Reached
Yes
No
END
Display Summary & end the game!
User Decision (x,y,c)
n
c
x
n (change pokemon)
c (continue with the same pokemon)

Code

```
import random
import time
from tabulate import tabulate

def display_pokemon_options(pokemon_dict):
    print("                                                Select your Pokemon
Character Here!!!\n                                                        ↓
↓ ↓ ↓ ↓ ↓ ↓ ↓")
    for key, value in pokemon_dict.items():
        print(f"                                                Pokemon:
{key:<10} ---  Base Power: {value}")
    print()

def choose_pokemon(pokemon_dict):
    while True:
        chosen_pokemon = input("Which pokemon would you like to choose:
").capitalize()
        if chosen_pokemon in pokemon_dict:
            return chosen_pokemon
        else:
            print("Invalid input, please choose a valid Pokemon.")
            continue

def calculate_power(base_power, category):
    if category == "Weak":
        additional_power = random.randint(50, 100)
    elif category == "Average":
        additional_power = random.randint(101, 150)
    else:  # Strong
        additional_power = random.randint(151, 200)
    current_power = base_power + additional_power
    return additional_power, current_power

def determine_category_and_calculate(pokemon_dict, chosen_pokemon):
    categories = ["Weak", "Average", "Strong"]
    random_category = random.choice(categories)
```

```
    base_power = pokemon_dict[chosen_pokemon]
    additional_power, current_power = calculate_power(base_power,
random_category)

    return random_category, additional_power, current_power

def random_enemy(pokemon_dict):
    random_player = random.randint(100, 1000)
    print("
Calculating Power...                    ")
    time.sleep(3)
    print("                                                    Finding
Enemy...")
    time.sleep(3)
    print(
        f"------------------------------------------- Enemy Found
(Player_{random_player})
-----------------------------------------")

    enemy_pokemon = random.choice(list(pokemon_dict.keys()))
    enemy_base_power = pokemon_dict[enemy_pokemon]

    enemy_categories = ["Weak", "Average", "Strong"]
    enemy_category = random.choice(enemy_categories)

    additional_power, current_power = calculate_power(enemy_base_power,
enemy_category)

    return {
        'pokemon': enemy_pokemon,
        'category': enemy_category,
        'additional_power': additional_power,
        'current_power': current_power
    }

def main():
    player_pokemon = {
        "Pikachu": 50,
        "Charmander": 55,
        "Bulbasaur": 60,
        "Squirtle": 58,
        "Jigglypuff": 45,
```

```
    "Eeve": 52,
    "Snorlax": 80,
    "Gengar": 70,
    "Machamp": 75,
    "Mewtwo": 90,
}

computer_pokemon = {
    "Pikachu": 50,
    "Charmander": 55,
    "Bulbasaur": 60,
    "Squirtle": 58,
    "Jigglypuff": 45,
    "Eeve": 52,
    "Snorlax": 80,
    "Gengar": 70,
    "Machamp": 75,
    "Mewtwo": 90,
}

chosen_pokemon = None
enemy = None  # Dictionary to store enemy details

user_wins = 0
computer_wins = 0

battle_number = 1
battle_summary = []

pokemon_change_limit = 3
pokemon_changes = 0
max_battles = 3

while battle_number <= max_battles:
    if chosen_pokemon is None:
        display_pokemon_options(player_pokemon)
        chosen_pokemon = choose_pokemon(player_pokemon)

    # Find the enemy after the player has chosen their pokemon
    enemy = random_enemy(computer_pokemon)

    # Determine power for the current pokemon
```

```
        pokemon_category, pokemon_additional_power,
pokemon_current_power = determine_category_and_calculate(
            player_pokemon, chosen_pokemon)

        print("
Battle Time!")
        time.sleep(1)
        print("
3")
        time.sleep(1)
        print("
2")
        time.sleep(1)
        print("
1")
        time.sleep(1)

        # Print battle details
        print(f"Your Pokemon: {chosen_pokemon} ({pokemon_category})")
        print(f"Base Power: {player_pokemon[chosen_pokemon]}")
        print(f"Additional Power: {pokemon_additional_power}")
        print(f"Current Power: {pokemon_current_power}")
        print()
        print("
V.S")
        print()
        print(f"Enemy Pokemon: {enemy['pokemon']}
({enemy['category']})")
        print(f"Base Power: {computer_pokemon[enemy['pokemon']]}")
        print(f"Additional Power: {enemy['additional_power']}")
        print(f"Current Power: {enemy['current_power']}")

        # Compare powers and determine the outcome
        if pokemon_current_power > enemy['current_power']:
            print("
You Win!")
            # Update the base power of the winning pokemon
            player_pokemon[chosen_pokemon] += enemy['current_power']
            user_wins += 1
            result = "User Wins"
        elif pokemon_current_power < enemy['current_power']:
```

```
            print("
You Lose!")
            # Update the base power of the losing pokemon and the enemy
            if player_pokemon[chosen_pokemon] > enemy['current_power']:
                player_pokemon[chosen_pokemon] -=
enemy['current_power']
            else:
                player_pokemon[chosen_pokemon] = 0
            computer_pokemon[enemy['pokemon']] += pokemon_current_power
            computer_wins += 1
            # Change computer's pokemon if it lost
            result = "Computer Wins"
        else:
            print("
It's a tie.")
            result = "Tie"

        print(f"Updated {chosen_pokemon}'s Base Power:
{player_pokemon[chosen_pokemon]}")

        # Add battle details to summary
        battle_summary.append({
            'battle_number': battle_number,
            'user_power': pokemon_current_power,
            'enemy_power': enemy['current_power'],
            'status': result
        })
        battle_number += 1

        # Prompt user for next action
        while True:
            print(
                "Do you want to continue battling? (Press 'c' to
continue with the same pokemon, 'n' to choose a new pokemon, 'x' to
exit)")
            choice = input("---->").lower()

            if choice == 'x':
                print("~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~Thank you for
playing!~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~")
                print("\nOverall Winner: " + (
```

```
                    'User' if user_wins > computer_wins else 'Computer'
if computer_wins > user_wins else 'No One (Tie)'))
                print(f"Total Battles: {battle_number - 1}")
                print(f"User Wins: {user_wins}")
                print(f"Computer Wins: {computer_wins}")

                # Display battle summary using tabulate
                print("\nBattle Summary:")
                table_data = [
                    [battle['battle_number'], battle['user_power'],
battle['enemy_power'], battle['status']]
                    for battle in battle_summary
                ]
                headers = ["Battle Number", "User Power", "Enemy
Power", "Status"]
                print(tabulate(table_data, headers, tablefmt="grid"))

                return
            elif choice == 'n':
                if pokemon_changes < pokemon_change_limit:
                    # Reset chosen pokemon and find a new enemy
                    chosen_pokemon = None  # Reset chosen pokemon to
allow new selection
                    pokemon_changes += 1
                    break
                else:
                    print(f"You have reached the limit of
{pokemon_change_limit} pokemon changes.")
                    break
            elif choice == 'c':
                # Keep the current enemy and pokemon
                break
            else:
                print("Invalid input. Please enter 'c', 'n', or 'x'.")

    # End of game message
    print("~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~Thank you for
playing!~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~")
    print("\nOverall Winner: " + (
        'User' if user_wins > computer_wins else 'Computer' if
computer_wins > user_wins else 'No One (Tie)'))
    print(f"Total Battles: {max_battles}")
```

```
    print(f"User Wins: {user_wins}")
    print(f"Computer Wins: {computer_wins}")

    # Display battle summary using tabulate
    print("\nBattle Summary:")
    table_data = [
        [battle['battle_number'], battle['user_power'],
battle['enemy_power'], battle['status']]
        for battle in battle_summary
    ]
    headers = ["Battle Number", "User Power", "Enemy Power", "Status"]
    print(tabulate(table_data, headers, tablefmt="grid"))

if __name__ == "__main__":
    main()
```

Output

```
C:\Users\Administrator\PycharmProjects\pythonProject2\venv\Scripts\python.exe C:\Users\Administrator\PycharmProjects\pythonProject2\pokemon.py
                                    Select your Pokemon Character Here!!!
                                              ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓
                                   Pokemon: Pikachu    ---  Base Power: 50
                                   Pokemon: Charmander ---  Base Power: 55
                                   Pokemon: Bulbasaur  ---  Base Power: 60
                                   Pokemon: Squirtle   ---  Base Power: 58
                                   Pokemon: Jigglypuff ---  Base Power: 45
                                   Pokemon: Eeve       ---  Base Power: 52
                                   Pokemon: Snorlax    ---  Base Power: 80
                                   Pokemon: Gengar     ---  Base Power: 70
                                   Pokemon: Machamp    ---  Base Power: 75
                                   Pokemon: Mewtwo     ---  Base Power: 90

Which pokemon would you like to choose: gengar
                                                Calculating Power...
                                                Finding Enemy...
```

```
------------------------------------------- Enemy Found (Player_135) -------------------------------------------
                                                Battle Time!
                                                     3
                                                     2
                                                     1
Your Pokemon: Gengar (Weak)
Base Power: 70
Additional Power: 54
Current Power: 124

                                                    V.S

Enemy Pokemon: Charmander (Weak)
Base Power: 55
Additional Power: 85
Current Power: 140
                                                 You Lose!
Updated Gengar's Base Power: 0
Do you want to continue battling? (Press 'c' to continue with the same pokemon, 'n' to choose a new pokemon, 'x' to exit)
---->n
```

```
                                    Select your Pokemon Character Here!!!
                                              ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓
                                   Pokemon: Pikachu    ---  Base Power: 50
                                   Pokemon: Charmander ---  Base Power: 55
                                   Pokemon: Bulbasaur  ---  Base Power: 60
                                   Pokemon: Squirtle   ---  Base Power: 58
                                   Pokemon: Jigglypuff ---  Base Power: 45
                                   Pokemon: Eeve       ---  Base Power: 52
                                   Pokemon: Snorlax    ---  Base Power: 80
                                   Pokemon: Gengar     ---  Base Power: 0
                                   Pokemon: Machamp    ---  Base Power: 75
                                   Pokemon: Mewtwo     ---  Base Power: 90

Which pokemon would you like to choose: machamp
                                             Calculating Power...
                                             Finding Enemy...
------------------------------------------- Enemy Found (Player_874) -------------------------------------------
                                              Battle Time!
                                                    3
                                                    2
                                                    1
Your Pokemon: Machamp (Weak)
Base Power: 75
Additional Power: 96
Current Power: 171

                                                   V.S

Enemy Pokemon: Squirtle (Average)
Base Power: 58
Additional Power: 149
Current Power: 207
                                                You Lose!
Updated Machamp's Base Power: 0
Do you want to continue battling? (Press 'c' to continue with the same pokemon, 'n' to choose a new pokemon, 'x' to exit)
---->n
                                    Select your Pokemon Character Here!!!
                                              ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓
                                   Pokemon: Pikachu    ---  Base Power: 50
                                   Pokemon: Charmander ---  Base Power: 55
                                   Pokemon: Bulbasaur  ---  Base Power: 60
                                   Pokemon: Squirtle   ---  Base Power: 58
                                   Pokemon: Jigglypuff ---  Base Power: 45
                                   Pokemon: Eeve       ---  Base Power: 52
                                   Pokemon: Snorlax    ---  Base Power: 80
                                   Pokemon: Gengar     ---  Base Power: 0
                                   Pokemon: Machamp    ---  Base Power: 0
                                   Pokemon: Mewtwo     ---  Base Power: 90

Which pokemon would you like to choose: mewtwo
                                             Calculating Power...
                                             Finding Enemy...
------------------------------------------- Enemy Found (Player_743) -------------------------------------------
                                              Battle Time!
                                                    3
                                                    2
                                                    1
Your Pokemon: Mewtwo (Strong)
Base Power: 90
Additional Power: 180
```

```
Current Power: 270

                                                V.S

Enemy Pokemon: Pikachu (Weak)
Base Power: 50
Additional Power: 85
Current Power: 135
                                               You Win!
Updated Mewtwo's Base Power: 225
Do you want to continue battling? (Press 'c' to continue with the same pokemon, 'n' to choose a new pokemon, 'x' to exit)
---->x
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~Thank you for playing!~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Overall Winner: Computer
Total Battles: 3
User Wins: 1
Computer Wins: 2
```

```
Battle Summary:
+-----------------+--------------+---------------+---------------+
|   Battle Number |   User Power |   Enemy Power | Status        |
+=================+==============+===============+===============+
|               1 |          124 |           140 | Computer Wins |
+-----------------+--------------+---------------+---------------+
|               2 |          171 |           207 | Computer Wins |
+-----------------+--------------+---------------+---------------+
|               3 |          270 |           135 | User Wins     |
+-----------------+--------------+---------------+---------------+

Process finished with exit code 0
```

SAMPLE OUTPUT

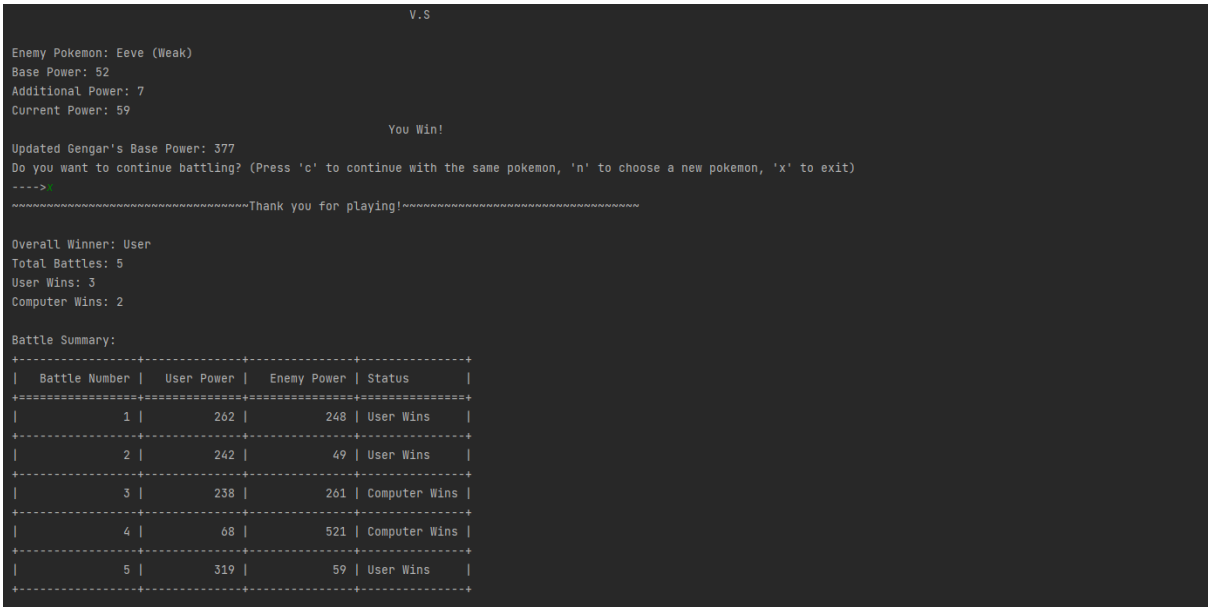
```
C:\Users\CLAB1-PC28\PycharmProjects\pythonProject2\venv\Scripts\python.exe C:/Users/CLAB1-PC28/PycharmProjects/pythonProject2/main.py
                                      Select your Pokemon Character Here!!!
                                               ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓
                                     Pokemon: Pikachu    ---  Base Power: 50
                                     Pokemon: Charmander ---  Base Power: 55
                                     Pokemon: Bulbasaur  ---  Base Power: 60
                                     Pokemon: Squirtle   ---  Base Power: 58
                                     Pokemon: Jigglypuff ---  Base Power: 45
                                     Pokemon: Eeve       ---  Base Power: 52
                                     Pokemon: Snorlax    ---  Base Power: 80
                                     Pokemon: Gengar     ---  Base Power: 70
                                     Pokemon: Machamp    ---  Base Power: 75
                                     Pokemon: Mewtwo     ---  Base Power: 90

Which pokemon would you like to choose: gengar
                                                Calculating Power...
                                                Finding Enemy...
---------------------------------------------- Enemy Found (Player_562) ----------------------------------------------
                                                 Battle Time!
                                                      3
                                                      2
                                                      1
Your Pokemon: Gengar (Strong)
Base Power: 70
Additional Power: 192
Current Power: 262

                                                      V.S

Enemy Pokemon: Eeve (Strong)
Base Power: 52
```

```
Additional Power: 196
Current Power: 248
                                                You Win!
Updated Gengar's Base Power: 318
Do you want to continue battling? (Press 'c' to continue with the same pokemon, 'n' to choose a new pokemon, 'x' to exit)
---->n
                                        Select your Pokemon Character Here!!!
                                                 ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓
                                       Pokemon: Pikachu    ---  Base Power: 50
                                       Pokemon: Charmander ---  Base Power: 55
                                       Pokemon: Bulbasaur  ---  Base Power: 60
                                       Pokemon: Squirtle   ---  Base Power: 58
                                       Pokemon: Jigglypuff ---  Base Power: 45
                                       Pokemon: Eeve       ---  Base Power: 52
                                       Pokemon: Snorlax    ---  Base Power: 80
                                       Pokemon: Gengar     ---  Base Power: 318
                                       Pokemon: Machamp    ---  Base Power: 75
                                       Pokemon: Mewtwo     ---  Base Power: 90

Which pokemon would you like to choose: eeve
                                                  Calculating Power...
                                                  Finding Enemy...
------------------------------------------------ Enemy Found (Player_858) ------------------------------------------------
                                                   Battle Time!
                                                        3
                                                        2
                                                        1

Your Pokemon: Eeve (Strong)
Base Power: 52
Additional Power: 190
Current Power: 242
```

```
                                                        V.S


Enemy Pokemon: Jigglypuff (Weak)
Base Power: 45
Additional Power: 4
Current Power: 49
                                                You Win!
Updated Eeve's Base Power: 101
Do you want to continue battling? (Press 'c' to continue with the same pokemon, 'n' to choose a new pokemon, 'x' to exit)
---->n
                                        Select your Pokemon Character Here!!!
                                                 ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓
                                       Pokemon: Pikachu    ---  Base Power: 50
                                       Pokemon: Charmander ---  Base Power: 55
                                       Pokemon: Bulbasaur  ---  Base Power: 60
                                       Pokemon: Squirtle   ---  Base Power: 58
                                       Pokemon: Jigglypuff ---  Base Power: 45
                                       Pokemon: Eeve       ---  Base Power: 101
                                       Pokemon: Snorlax    ---  Base Power: 80
                                       Pokemon: Gengar     ---  Base Power: 318
                                       Pokemon: Machamp    ---  Base Power: 75
                                       Pokemon: Mewtwo     ---  Base Power: 90

Which pokemon would you like to choose: jigglypuff
                                                  Calculating Power...
                                                  Finding Enemy...
------------------------------------------------ Enemy Found (Player_434) ------------------------------------------------
                                                   Battle Time!
                                                        3
                                                        2
                                                        1
```

```
Your Pokemon: Jigglypuff (Strong)
Base Power: 45
Additional Power: 193
Current Power: 238

                                                V.S

Enemy Pokemon: Mewtwo (Strong)
Base Power: 90
Additional Power: 171
Current Power: 261
                                              You Lose!
Updated Jigglypuff's Base Power: 0
Do you want to continue battling? (Press 'c' to continue with the same pokemon, 'n' to choose a new pokemon, 'x' to exit)
---->c
                                            Calculating Power...
                                            Finding Enemy...
-------------------------------------------- Enemy Found (Player_393) --------------------------------------------
                                             Battle Time!
                                                  3
                                                  2
                                                  1
Your Pokemon: Jigglypuff (Average)
Base Power: 0
Additional Power: 68
Current Power: 68

                                                V.S

Enemy Pokemon: Mewtwo (Strong)
Base Power: 328
```

```
Additional Power: 193
Current Power: 521
                                              You Lose!
Updated Jigglypuff's Base Power: 0
Do you want to continue battling? (Press 'c' to continue with the same pokemon, 'n' to choose a new pokemon, 'x' to exit)
---->n
                                       Select your Pokemon Character Here!!!
                                            ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓
                                      Pokemon: Pikachu    ---  Base Power: 50
                                      Pokemon: Charmander ---  Base Power: 55
                                      Pokemon: Bulbasaur  ---  Base Power: 60
                                      Pokemon: Squirtle   ---  Base Power: 58
                                      Pokemon: Jigglypuff ---  Base Power: 0
                                      Pokemon: Eeve       ---  Base Power: 101
                                      Pokemon: Snorlax    ---  Base Power: 80
                                      Pokemon: Gengar     ---  Base Power: 318
                                      Pokemon: Machamp    ---  Base Power: 75
                                      Pokemon: Mewtwo     ---  Base Power: 90

Which pokemon would you like to choose: gengar
                                            Calculating Power...
                                            Finding Enemy...
-------------------------------------------- Enemy Found (Player_152) --------------------------------------------
                                             Battle Time!
                                                  3
                                                  2
                                                  1
Your Pokemon: Gengar (Weak)
Base Power: 318
Additional Power: 1
Current Power: 319
```



My Learnings:

Working in this lab has been a great way for me to go back and refresh the programming skills I learned in my first year. It helped me remember the basics and gave me a chance to use them in a real project, which made things clearer for me. Doing this also showed me how much I've improved, especially in solving problems and writing better code. I deepened my understanding by learning about the use of None in Python, which helped me better manage variables and states in my code. Additionally, I got to explore the tabulate library, which was completely new to me. It made displaying data in a clean, tabular format much easier and more professional. Overall, this experience not only refreshed my old knowledge but also expanded it with these valuable new tools and techniques.