BEng(Hons) Software Engineering (Level 4)

Module: 4COSC006C.1 Software Development I

Module leader: Mr. Guganathan Poravi

Assessment Type: Individual work

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Pseudocode

1. Process_display_csv_data
2.   import csv
3.   from collections import Counter
4.   import math
5.   from pathlib import Path
6.
7.   FUNCTION validate_date_input()
8.   FUNCTION is_leap_year(year)
9.   RETURN True IF year is divisible by 4 AND (year is not divisible by 100 OR year is divisible by 400)
10.
11.   WHILE True
12.   PROMPT user to enter day in format dd
13.   TRY
14.   CONVERT input to integer day
15.   IF day is between 1 and 31 THEN
16.   BREAK
17.   ELSE
18.   PRINT "Out of range - values must be in the range 1 and 31."
19.   EXCEPT ValueError
20.   PRINT "Integer required for the day."
21.
22.   PROMPT user to enter month in format MM
23.   TRY
24.   CONVERT input to integer month
25.   IF month is between 1 and 12 THEN
26.   BREAK
27.   ELSE
28.   PRINT "Out of range - values must be in the range 1 to 12."
29.   EXCEPT ValueError
30.   PRINT "Integer required for the month."
31.
32.   PROMPT user to enter year in format YYYY
33.   TRY
34.   CONVERT input to integer year
35.   IF year is between 2000 and 2024 THEN
36.   BREAK
37.   ELSE
38.   PRINT "Out of range - values must range from 2000 to 2024."
39.   EXCEPT ValueError
40.   PRINT "Integer required for the year."
41.
42.   SET max_days to 31

```
43.        IF month is 2 THEN
44.          IF is_leap_year(year) THEN
45.            SET max_days to 29
46.          ELSE
47.            SET max_days to 28
48.        ELSE IF month is in {4, 6, 9, 11} THEN
49.          SET max_days to 30
50.
51.        IF day is not between 1 and max_days THEN
52.          PRINT "Invalid day for month {month} in year {year}. Please enter a
value between 1 and {max_days}."
53.          CONTINUE
54.
55.        RETURN formatted date as "DD/MM/YYYY"
56.
57.    FUNCTION process_csv_data(file_name)
58.      TRY
59.        OPEN file_name as csv_file
60.        READ csv data into csv_data
61.
62.        INITIALIZE counters for various vehicle types and statistics
63.
64.        FOR each line in csv_data DO
65.          INCREMENT total_vehicles
66.          SPLIT timeOfDay into hour, minutes, seconds
67.          CONVERT time to numeric format as time_number
68.
69.          IF VehicleType is "Truck" THEN
70.            INCREMENT total_trucks
71.          IF VehicleType is in ["Bicycle", "Motorcycle", "Scooter"] THEN
72.            INCREMENT two_wheeled_vehicles
73.          IF VehicleType is "Bicycle" THEN
74.            INCREMENT total_bicycle
75.          IF VehicleType is "Buss" AND JunctionName is "Elm Avenue/Rabbit
Road" AND travel_Direction_out is "N" THEN
76.            INCREMENT bus_north
77.
78.          IF elctricHybrid is "True" THEN
79.            INCREMENT total_electric_vehicles
80.
81.          IF travel_Direction_in is equal to travel_Direction_out THEN
82.            INCREMENT vehicle_no_turn
83.          IF VehicleSpeed is greater than JunctionSpeedLimit THEN
84.            INCREMENT vehicle_over_speed
85.          IF JunctionName is "Elm Avenue/Rabbit Road" THEN
86.            INCREMENT vehicle_elm_only
```

87.   IF VehicleType is "Scooter" THEN

88.   INCREMENT scooters_elm_only

89.

90.   IF JunctionName is "Hanley Highway/Westway" THEN

91.   INCREMENT vehicle_hanley

92.   APPEND time_number to times

93.   IF Weather_Conditions is in ["Heavy Rain", "Light Rain"] THEN

94.   APPEND time_number to time_rain

95.

96.   CALCULATE statistics based on counters

97.   RETURN a dictionary with calculated statistics

98.   EXCEPT FileNotFoundError

99.   PRINT "Error: The file {file_name} does not exist in the current directory."

100.   RETURN None

101.

102.   FUNCTION display_outcome(outcome)

103.   IF outcome is not None THEN

104.   PRINT formatted statistics from outcome

105.   ELSE

106.   PRINT "No results to display."

107.

108.   FUNCTION save_results_to_file(outcomes, file_name="results.txt")

109.   TRY

110.   PREPARE content string with formatted statistics from outcomes

111.   SET result_file to Path(file_name)

112.   SET mode to "a" if result_file exists ELSE "w"

113.   OPEN result_file in mode

114.   WRITE content to file

115.   PRINT "Results have been saved to {file_name}."

116.   EXCEPT KeyError

117.   PRINT "Error: Missing key in the outcomes."

118.   EXCEPT Exception

119.   PRINT "An unexpected error occurred."

120.

121.   FUNCTION validate_continue_input()

122.   WHILE True

123.   PROMPT user to continue (Y/N)

124.   IF user_input is in ['Y', 'N'] THEN

125.   RETURN user_input

126.   ELSE

127.   PRINT "Invalid input"

128.

129. BEGIN Main Program

130.   WHILE True DO

131.   date = CALL validate_date_input()

132.   file_name = "traffic_data" + REPLACE(date, "/", "") + ".csv"
133.   outcome = CALL process_csv_data(file_name)
134.   CALL display_outcome(outcome)
135.   IF outcome IS NOT NULL THEN
136.   CALL save_results_to_file(outcome)
137.   continue_input = CALL validate_continue_input()
138.   IF continue_input EQUALS 'N' THEN
139.   PRINT "Thank you for using the traffic data analysis program. Goodbye!"
140.   BREAK
141. END Main Program

Test cases which are used to test the program and the results.

Date, Month and Year validation (15/06/2024)

```
Python 3.12.2 (v3.12.2:6abddd9f6a, Feb  6 2024, 17:02:06) [Clang 13.0.0 (clang-1300.0.29.30)] on darwin
Type "help", "copyright", "credits" or "license()" for more information.
>>>
============ RESTART: /Users/delaksan/Documents/w2120777/w2120777.py ===========
Please enter the day of the survey in the format dd: 15
Please enter the month of the survey in the format MM: 06
Please enter the year of the survey in the format YYYY: 2024
****************************
data file selected is traffic_data15062024.csv
****************************
The total number of vehicles recorded for this date is 1037
The total number of trucks recorded for this date is 109
The total number of electric vehicles for this date is 368
The total number of two-wheeled vehicles for this date is 401
The total number of Busses leaving Elm Avenue/Rabbit Road heading North is 15
The total number of Vehicles through both junctions not turning left or right is 363
The percentage of total vehicles recorded that are trucks for this date is 11%
the average number of Bikes per hour for this date is 7

The total number of Vehicles recorded as over the speed limit for this date is 205
The total number of vehicles recorded through Elm Avenue/Rabbit Road junction is 494
The total number of vehicles recorded through Hanley Highway/Westway junction is 543
11% of vehicles recorded through Elm Avenue/Rabbit Road are scooters.
The highest number of vehicles in an hour on Hanley Highway/Westway is 39
The most vehicles through Hanley Highway/Westway were recorded between 18.00 and 19.00
The number of hours of rain for this date is 0
Results have been saved to results.txt.
Do you want to run the program again with a new date? (Y/N):
```

<div style="text-align: right">Ln: 28 Col: 61</div>

	Date (DD)	Month (MM)	Year (YYYY)
Input	15	06	2024
Output	************************** Data file selected: traffic_data15062024.csv ************************** The total number of vehicles recorded for this date: 1037 The total number of trucks recorded for this date: 109 The total number of electric vehicles for this date: 368 The total number of two-wheeled vehicles for this date: 401 The total number of buses leaving Elm Avenue/Rabbit Road heading North: 15 The total number of vehicles not turning left or right: 363 The percentage of total vehicles recorded that are trucks: 11% The average number of bicycles per hour: 7 The total number of vehicles over the speed limit: 205 The total number of vehicles recorded through Elm Avenue/Rabbit Road: 494 The total number of vehicles recorded through Hanley Highway/Westway: 543 11% of vehicles recorded through Elm Avenue/Rabbit Road are scooters. The highest number of vehicles in an hour on Hanley Highway/Westway: 39 The peak hour for Hanley Highway/Westway: 18:00 - 19:00 The number of hours of rain for this date: 0

Asking to view new date.

```
Python 3.12.2 (v3.12.2:6abddd9f6a, Feb  6 2024, 17:02:06) [Clang 13.0.0 (clang-1300.0.29.30)] on darwin
Type "help", "copyright", "credits" or "license()" for more information.
>>>
============ RESTART: /Users/delaksan/Documents/w2120777/w2120777.py ===========
Please enter the day of the survey in the format dd: 15
Please enter the month of the survey in the format MM: 06
Please enter the year of the survey in the format YYYY: 2024
***************************
data file selected is traffic_data15062024.csv
***************************
The total number of vehicles recorded for this date is 1037
The total number of trucks recorded for this date is 109
The total number of electric vehicles for this date is 368
The total number of two-wheeled vehicles for this date is 401
The total number of Busses leaving Elm Avenue/Rabbit Road heading North is 15
The total number of Vehicles through both junctions not turning left or right is 363
The percentage of total vehicles recorded that are trucks for this date is 11%
the average number of Bikes per hour for this date is 7

The total number of Vehicles recorded as over the speed limit for this date is 205
The total number of vehicles recorded through Elm Avenue/Rabbit Road junction is 494
The total number of vehicles recorded through Hanley Highway/Westway junction is 543
11% of vehicles recorded through Elm Avenue/Rabbit Road are scooters.
The highest number of vehicles in an hour on Hanley Highway/Westway is 39
The most vehicles through Hanley Highway/Westway were recorded between 18.00 and 19.00
The number of hours of rain for this date is 0
Results have been saved to results.txt.
Do you want to run the program again with a new date? (Y/N):
```

Ln: 28 Col: 61

Input	Y
| Output | ```
Do you want to run the program again with a new date? (Y/N): Y
Please enter the day of the survey in the format dd: 16
Please enter the month of the survey in the format MM: 06
Please enter the year of the survey in the format YYYY: 2024
***************************
data file selected is traffic_data16062024.csv
***************************
The total number of vehicles recorded for this date is 101
The total number of trucks recorded for this date is 11
The total number of electric vehicles for this date is 29
The total number of two-wheeled vehicles for this date is 29
The total number of Busses leaving Elm Avenue/Rabbit Road heading North is 0
The total number of Vehicles through both junctions not turning left or right is 38
The percentage of total vehicles recorded that are trucks for this date is 11%
the average number of Bikes per hour for this date is 0

The total number of Vehicles recorded as over the speed limit for this date is 20
The total number of vehicles recorded through Elm Avenue/Rabbit Road junction is 52
The total number of vehicles recorded through Hanley Highway/Westway junction is 49
6% of vehicles recorded through Elm Avenue/Rabbit Road are scooters.
The highest number of vehicles in an hour on Hanley Highway/Westway is 5
The most vehicles through Hanley Highway/Westway were recorded between 1.00 and 2.00
The number of hours of rain for this date is 3
Results have been saved to results.txt.
``` |

Date, Month and Year validation (16/06/2024)

```
Please enter the month of the survey in the format MM: 06
Please enter the year of the survey in the format YYYY: 2024
**************************
data file selected is traffic_data15062024.csv
**************************
The total number of vehicles recorded for this date is 1037
The total number of trucks recorded for this date is 109
The total number of electric vehicles for this date is 368
The total number of two-wheeled vehicles for this date is 401
The total number of Busses leaving Elm Avenue/Rabbit Road heading North is 15
The total number of Vehicles through both junctions not turning left or right is 363
The percentage of total vehicles recorded that are trucks for this date is 11%
the average number of Bikes per hour for this date is 7

The total number of Vehicles recorded as over the speed limit for this date is 205
The total number of vehicles recorded through Elm Avenue/Rabbit Road junction is 494
The total number of vehicles recorded through Hanley Highway/Westway junction is 543
11% of vehicles recorded through Elm Avenue/Rabbit Road are scooters.
The highest number of vehicles in an hour on Hanley Highway/Westway is 39
The most vehicles through Hanley Highway/Westway were recorded between 18.00 and 19.00
The number of hours of rain for this date is 0
Results have been saved to results.txt.
Do you want to run the program again with a new date? (Y/N): Y
Please enter the day of the survey in the format dd: 16
Please enter the month of the survey in the format MM: 06
Please enter the year of the survey in the format YYYY: 2024
**************************
data file selected is traffic_data16062024.csv
**************************
The total number of vehicles recorded for this date is 101
The total number of trucks recorded for this date is 11
The total number of electric vehicles for this date is 29
The total number of two-wheeled vehicles for this date is 29
The total number of Busses leaving Elm Avenue/Rabbit Road heading North is 0
The total number of Vehicles through both junctions not turning left or right is 38
The percentage of total vehicles recorded that are trucks for this date is 11%
the average number of Bikes per hour for this date is 0

The total number of Vehicles recorded as over the speed limit for this date is 20
The total number of vehicles recorded through Elm Avenue/Rabbit Road junction is 52
The total number of vehicles recorded through Hanley Highway/Westway junction is 49
6% of vehicles recorded through Elm Avenue/Rabbit Road are scooters.
The highest number of vehicles in an hour on Hanley Highway/Westway is 5
The most vehicles through Hanley Highway/Westway were recorded between 1.00 and 2.00
The number of hours of rain for this date is 3
Results have been saved to results.txt.
Do you want to run the program again with a new date? (Y/N): |
```
Ln: 52 Col: 61

	Date (DD)	Month (MM)	Year (YYYY)
Input	16	06	2024
Output	************************* Data file selected: traffic_data16062024.csv ************************* The total number of vehicles recorded for this date: 101 The total number of trucks recorded for this date: 11 The total number of electric vehicles for this date: 29 The total number of two-wheeled vehicles for this date: 29 The total number of buses leaving Elm Avenue/Rabbit Road heading North: 0 The total number of vehicles not turning left or right: 38 The percentage of total vehicles recorded that are trucks: 11% The average number of bicycles per hour: 0 The total number of vehicles over the speed limit: 20 The total number of vehicles recorded through Elm Avenue/Rabbit Road: 52 The total number of vehicles recorded through Hanley Highway/Westway: 49 6% of vehicles recorded through Elm Avenue/Rabbit Road are scooters. The highest number of vehicles in an hour on Hanley Highway/Westway: 5 The peak hour for Hanley Highway/Westway: 1:00 - 2:00 The number of hours of rain for this date: 3		

```
Please enter the year of the survey in the format YYYY: 2024
**************************
data file selected is traffic_data16062024.csv
**************************
The total number of vehicles recorded for this date is 101
The total number of trucks recorded for this date is 11
The total number of electric vehicles for this date is 29
The total number of two-wheeled vehicles for this date is 29
The total number of Busses leaving Elm Avenue/Rabbit Road heading North is 0
The total number of Vehicles through both junctions not turning left or right is 38
The percentage of total vehicles recorded that are trucks for this date is 11%
the average number of Bikes per hour for this date is 0

The total number of Vehicles recorded as over the speed limit for this date is 20
The total number of vehicles recorded through Elm Avenue/Rabbit Road junction is 52
The total number of vehicles recorded through Hanley Highway/Westway junction is 49
6% of vehicles recorded through Elm Avenue/Rabbit Road are scooters.
The highest number of vehicles in an hour on Hanley Highway/Westway is 5
The most vehicles through Hanley Highway/Westway were recorded between 1.00 and 2.00
The number of hours of rain for this date is 3
Results have been saved to results.txt.
Do you want to run the program again with a new date? (Y/N): Y
Please enter the day of the survey in the format dd: 21
Please enter the month of the survey in the format MM: 06
Please enter the year of the survey in the format YYYY: 2024
**************************
data file selected is traffic_data21062024.csv
**************************
The total number of vehicles recorded for this date is 1334
The total number of trucks recorded for this date is 138
The total number of electric vehicles for this date is 442
The total number of two-wheeled vehicles for this date is 503
The total number of Busses leaving Elm Avenue/Rabbit Road heading North is 19
The total number of Vehicles through both junctions not turning left or right is 494
The percentage of total vehicles recorded that are trucks for this date is 10%
the average number of Bikes per hour for this date is 10

The total number of Vehicles recorded as over the speed limit for this date is 250
The total number of vehicles recorded through Elm Avenue/Rabbit Road junction is 651
The total number of vehicles recorded through Hanley Highway/Westway junction is 683
10% of vehicles recorded through Elm Avenue/Rabbit Road are scooters.
The highest number of vehicles in an hour on Hanley Highway/Westway is 71
The most vehicles through Hanley Highway/Westway were recorded between 18.00 and 19.00
The number of hours of rain for this date is 6
Results have been saved to results.txt.
Do you want to run the program again with a new date? (Y/N):
```

Ln: 76 Col: 61

	Date (DD)	Month (MM)	Year (YYYY)
Input	21	06	2024
Output	************************** Data file selected: traffic_data21062024.csv ************************** The total number of vehicles recorded for this date: 1334 The total number of trucks recorded for this date: 138 The total number of electric vehicles for this date: 442 The total number of two-wheeled vehicles for this date: 503 The total number of buses leaving Elm Avenue/Rabbit Road heading North: 19 The total number of vehicles not turning left or right: 494 The percentage of total vehicles recorded that are trucks: 10% The average number of bicycles per hour: 10 The total number of vehicles over the speed limit: 250 The total number of vehicles recorded through Elm Avenue/Rabbit Road: 651 The total number of vehicles recorded through Hanley Highway/Westway: 683 10% of vehicles recorded through Elm Avenue/Rabbit Road are scooters. The highest number of vehicles in an hour on Hanley Highway/Westway: 71 The peak hour for Hanley Highway/Westway: 18:00 - 19:00 The number of hours of rain for this date: 6

Ending View New Date

```
data file selected is traffic_data16062024.csv
***************************
The total number of vehicles recorded for this date is 101
The total number of trucks recorded for this date is 11
The total number of electric vehicles for this date is 29
The total number of two-wheeled vehicles for this date is 29
The total number of Busses leaving Elm Avenue/Rabbit Road heading North is 0
The total number of Vehicles through both junctions not turning left or right is 38
The percentage of total vehicles recorded that are trucks for this date is 11%
the average number of Bikes per hour for this date is 0

The total number of Vehicles recorded as over the speed limit for this date is 20
The total number of vehicles recorded through Elm Avenue/Rabbit Road junction is 52
The total number of vehicles recorded through Hanley Highway/Westway junction is 49
6% of vehicles recorded through Elm Avenue/Rabbit Road are scooters.
The highest number of vehicles in an hour on Hanley Highway/Westway is 5
The most vehicles through Hanley Highway/Westway were recorded between 1.00 and 2.00
The number of hours of rain for this date is 3
Results have been saved to results.txt.
Do you want to run the program again with a new date? (Y/N): Y
Please enter the day of the survey in the format dd: 21
Please enter the month of the survey in the format MM: 06
Please enter the year of the survey in the format YYYY: 2024
***************************
data file selected is traffic_data21062024.csv
***************************
The total number of vehicles recorded for this date is 1334
The total number of trucks recorded for this date is 138
The total number of electric vehicles for this date is 442
The total number of two-wheeled vehicles for this date is 503
The total number of Busses leaving Elm Avenue/Rabbit Road heading North is 19
The total number of Vehicles through both junctions not turning left or right is 494
The percentage of total vehicles recorded that are trucks for this date is 10%
the average number of Bikes per hour for this date is 10

The total number of Vehicles recorded as over the speed limit for this date is 250
The total number of vehicles recorded through Elm Avenue/Rabbit Road junction is 651
The total number of vehicles recorded through Hanley Highway/Westway junction is 683
10% of vehicles recorded through Elm Avenue/Rabbit Road are scooters.
The highest number of vehicles in an hour on Hanley Highway/Westway is 71
The most vehicles through Hanley Highway/Westway were recorded between 18.00 and 19.00
The number of hours of rain for this date is 6
Results have been saved to results.txt.
Do you want to run the program again with a new date? (Y/N): N
Thank you for using the traffic data analysis program. Goodbye!
>>>
                                                                    Ln: 78  Col: 0
```

Input	N
Output	Thank you for using the traffic data analysis program. Goodbye!

Invalid Day Input

```
Python 3.12.2 (v3.12.2:6abddd9f6a, Feb  6 2024, 17:02:06) [Clang 13.0.0 (clang-1300.0.29.30)] on darwin
Type "help", "copyright", "credits" or "license()" for more information.
>>>
============ RESTART: /Users/delaksan/Documents/w2120777/w2120777.py ===========
Please enter the day of the survey in the format dd: 40
Out of range — values must be in the range 1 and 31.
Please enter the day of the survey in the format dd:
```

<p align="right">Ln: 7 Col: 53</p>

Input	40
Output	Out of range - values must be in the range 1 and 31.
	Please enter the day of the survey in the format dd:

Invalid Month Input

```
Python 3.12.2 (v3.12.2:6abddd9f6a, Feb  6 2024, 17:02:06) [Clang 13.0.0 (clang-1300.0.29.30)] on darwin
Type "help", "copyright", "credits" or "license()" for more information.

============ RESTART: /Users/delaksan/Documents/w2120777/w2120777.py ===========
Please enter the day of the survey in the format dd: 40
Out of range - values must be in the range 1 and 31.
Please enter the day of the survey in the format dd: 09
Please enter the month of the survey in the format MM: 40
Out of range - values must be in the range 1 to 12.
Please enter the month of the survey in the format MM:
```

Input	40
Output	Out of range - values must be in the range 1 to 12. Please enter the month of the survey in the format MM:

Invalid Year Input

```
Python 3.12.2 (v3.12.2:6abddd9f6a, Feb  6 2024, 17:02:06) [Clang 13.0.0 (clang-1300.0.29.30)] on darwin
Type "help", "copyright", "credits" or "license()" for more information.
=========== RESTART: /Users/delaksan/Documents/w2120777/w2120777.py ===========
Please enter the day of the survey in the format dd: 40
Out of range - values must be in the range 1 and 31.
Please enter the day of the survey in the format dd: 09
Please enter the month of the survey in the format MM: 40
Out of range - values must be in the range 1 to 12.
Please enter the month of the survey in the format MM: 10
Please enter the year of the survey in the format YYYY: 10000
Out of range - values must range from 2000 to 2024.
Please enter the year of the survey in the format YYYY:
```

Input	10000
Output	Out of range - values must range from 2000 to 2024. Please enter the year of the survey in the format YYYY:

File doesn't exist.

```
Python 3.12.2 (v3.12.2:6abddd9f6a, Feb  6 2024, 17:02:06) [Clang 13.0.0 (clang-1300.0.29.30)] on darwin
Type "help", "copyright", "credits" or "license()" for more information.
>>>
============ RESTART: /Users/delaksan/Documents/w2120777/w2120777.py ===========
Please enter the day of the survey in the format dd: 40
Out of range - values must be in the range 1 and 31.
Please enter the day of the survey in the format dd: 09
Please enter the month of the survey in the format MM: 40
Out of range - values must be in the range 1 to 12.
Please enter the month of the survey in the format MM: 10
Please enter the year of the survey in the format YYYY: 10000
Out of range - values must range from 2000 to 2024.
Please enter the year of the survey in the format YYYY: 2004
Error: The file traffic_data09102004.csv does not exist in the current directory.
No results to display.
Do you want to run the program again with a new date? (Y/N): |
```

Ln: 16 Col: 61

	Date (DD)	Month (MM)	Year (YYYY)
Input	09	10	2004
Output	Error: The file traffic_data09102004.csv does not exist in the current directory. No results to display. Do you want to run the program again with a new date? (Y/N):		

Leap Year Identification

```
Python 3.12.2 (v3.12.2:6abddd9f6a, Feb  6 2024, 17:02:06) [Clang 13.0.0 (clang-1300.0.29.30)] on darwin
Type "help", "copyright", "credits" or "license()" for more information.
============ RESTART: /Users/delaksan/Documents/w2120777/w2120777.py ===========
Please enter the day of the survey in the format dd: 30
Please enter the month of the survey in the format MM: 02
Please enter the year of the survey in the format YYYY: 2024
Invalid day for month 2 in year 2024. Please enter a value between 1 and 29.
Please enter the day of the survey in the format dd:
```

	Date (DD)	Month (MM)	Year (YYYY)
Input	30	02	2024
Output	Invalid day for month 2 in year 2024. Please enter a value between 1 and 29. Please enter the day of the survey in the format dd:		

References

1. W3Schools. (2024, November 19). Python Tutorial. W3Schools. https://www.w3schools.com/python/

2. Informatics Institute of Technology. (May 2024). *Professional Certificate in Python Programming*. Credential ID: 6991.

3. LinkedIn. (December 2024). *Critical Thinking and Problem Solving*. Credential ID: 3e8d43abbf0e621e88830f049d00aedb9e8445447a6983d04a40c259eaf2f23a.

4. Great Learning. (February 2024). *Programming Basics*. Completed during the "Get Started with Python" event, hosted by Microsoft Learn Student Ambassadors Shalitha Madhuwantha.