GTU Department of Computer Engineering
CSE 222/505 - Spring 2022
Homework #1 Report

Hasan Mutlu
1801042673

1. SYSTEM REQUIREMENTS

Functional Requirements:

- ➔ User must be able to create a street in an allowed length.
- ➔ User must be able to add a building/playground by entering building's side, position, length and other properties. If the desired position is available and the building's data are valid, building must be created.
- ➔ User must be able to delete a building/playground. To delete a building, a basic list of buildings on the street shall be shown to the user and user should choose the side and address of the building he/she wants to delete.
- ➔ User must be able to display the total remaining length of lands on the street. The remaining length of lands on each side should also be displayed to give user a better understanding.
- ➔ User must be able to display the list of buildings on the street. There should be two types of lists, a basic one and a detailed one. User should choose which kind of list he/she wants to see. In basic list, only the types of buildings in each side should be displayed. In detailed list, all the properties of all the buildings should be displayed.
- ➔ User must be able to display the number and ratio of lenth of playgrounds in the street.
- ➔ User must be able to calculate the total length of street occupied by the markets, houses or offices.
- ➔ User must be able to display the skyline silhouette of the street.
- ➔ User must be able to focus on a building. To focus on a building, a basic list of buildings should be displayed to the user and the user should select which building he/she wants to focus by entering side and address of the building.
- ➔ User should be able to navigate between functionalities in a menu. The navigation should be provided by entering the figure of the desired option.
- ➔ User should be able to choose whether he/she wants to use the program with the default street created in driver function or create a new empty street.

Non-Functional Requirements:

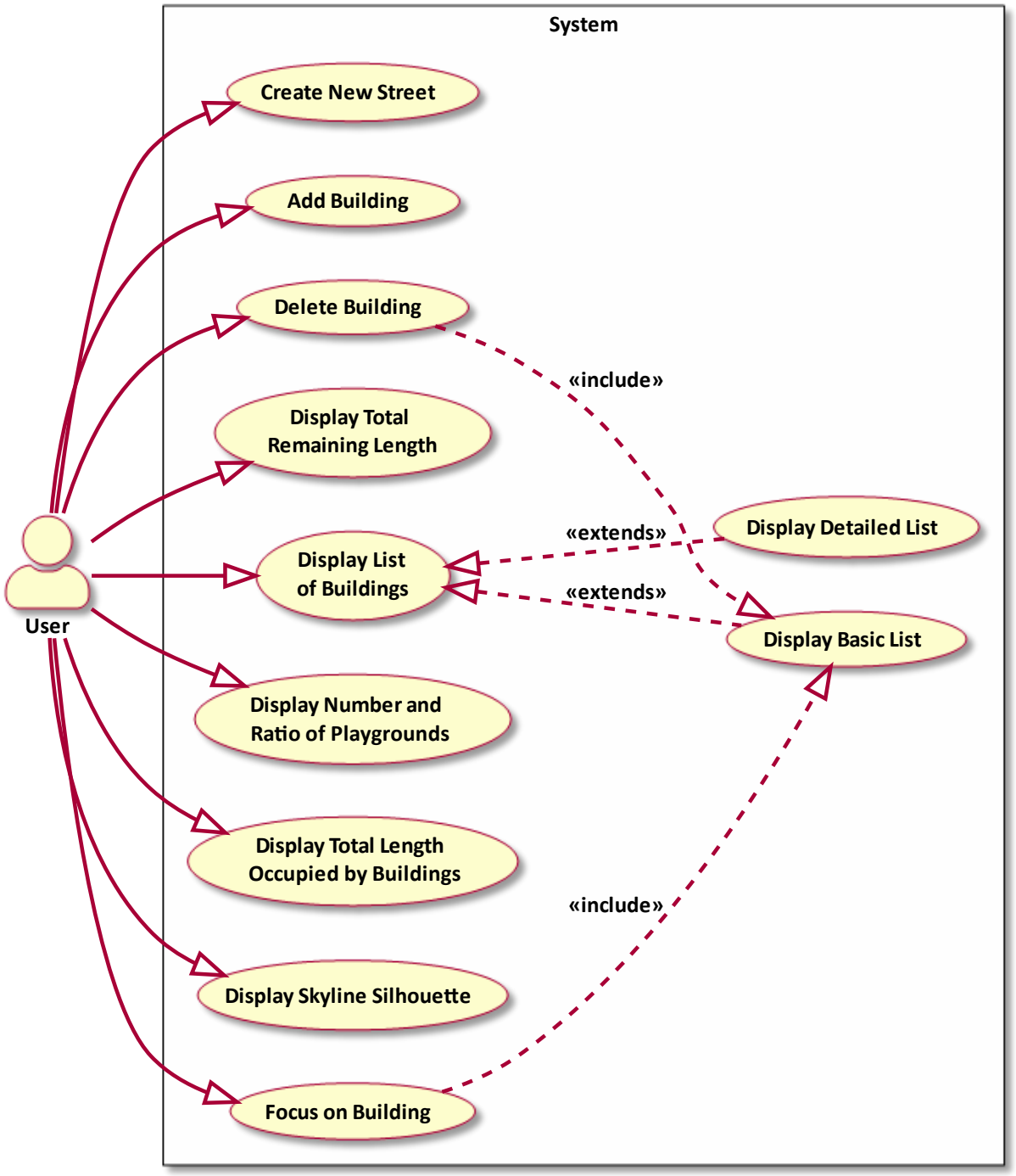
- ➔ Implementation: The program shall be implemented using VSCode, Ubuntu 18.04 WSL and Java 11.
- ➔ Compiling an Running: The program should be compiled and run with following commands:

```
-$ javac *.java Main.java
-$ java Main
```

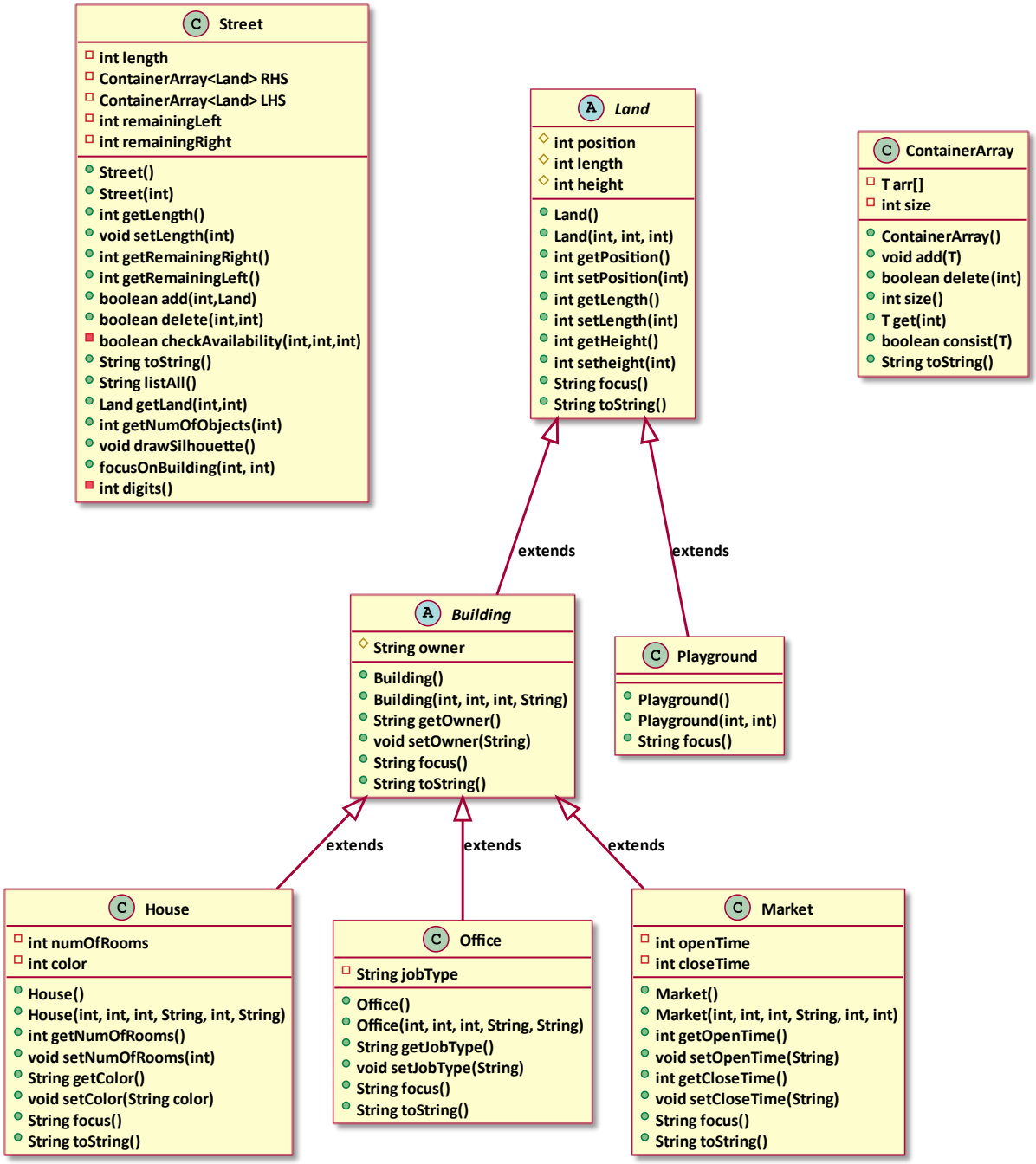
- ➔ Maintainability: The program should be maintainable in order to add new features in the future if necessary.
- ➔ Efficiency: The program should be efficient, should have high performance and shouldn't consume too much memory. It should allocate and deallocate memory when new buildings are added and deleted.
- ➔ Reliable: The program should be reliable. It's mechanisms should work successfully in any combination of use. It should check the validity of inputs and when there is an unexpected situation, program should handle it instead of stopping.
- ➔ Compatibility: The program should be compatible with the facilities of the terminal interface. To achive this, some functionalities may be restricted. For example, the maximum length of the street should be limited in order to fit the skyline silhouette in the terminal.

2. USE CASE AND CLASS DIAGRAMS

Use Case Diagram:



Class Diagram:



3. OTHER DIAGRAMS

4. PROBLEM SOLUTION APPROACH

Firstly I identified the problem. The problem includes adding and deleting new data. To achive this in permitted borders, I implemented my own container array structure to store data dynamically at first. In the problem, there are different kinds of objects that are located on the street, so I created a hierarchial set of classes under abstract Land class to define different kinds of buildings and made use of polymorphism. Then, I created a street class to include the street's properties and store buildings in it by using my own container array. After these steps, I started implementing the necessary functionalities and tested each new implementation.

While testing, I created the overall structure of the driver function and interactive program as well. After deciding that the functionalities are successfully implemented, I organized the driver function and interactive program to communicate with the user better. After finishing everything, I tested the program once again for the last time and fixed the encountered problems.

Note: The place of the focus mode is not specified so I deciced to include it in the view mode.

5. TEST CASES

Test Case #	Test Case Description	Test Data	Expected Result	Actual Result	Pass/Fail
1	Create street	Length: 100	No error messages	As Expected	Pass
2	Add Playground	Side: 1 (Left) Position: 0 Length: 20	"New Playground is added" message	As Expected	Pass
3	Add House	Side: 2 (Right) Position: 0 Length: 15 Height: 20 Owner: "Ali Bey" Number of Rooms: 5 Color: "Green"	"New House is added." message	As Expected	Pass
4	Add Office	Side: 1 (Left) Position: 25 Length: 25 Height: 25 Owner: "Veli Bey" Job Type: "Law Firm"	"New Office is added." message	As Expected	Pass
5	Add Market	Side: 2 (Right) Position: 15 Length: 10 Height: 10 Owner: Zeynep Hanim Opening Time: 10 Closing Time: 21	"New Market is added." message	As Expected	Pass
6	Add Playground	Side: 1 (Left) Position: 55 Length: 20	"New Playground is added" message	As Expected	Pass

7	Add House	Side: 1 (Left) Position: 80 Length: 20 Height: 25 Owner: Ahmet Bey Number of Rooms: 7 Color: Blue	"New House is added." message	As Expected	Pass
8	Add Office	Side: 2 (Right) Position: 35 Length: 25 Height: 40 Owner: Ayse Hanim Job Type: Technology Company	"New Office is added." message	As Expected	Pass
9	Add Market	Side: 2 (Right) Position: 65 Length: 20 Height: 15 Owner: Selim Bey Opening Time: 8 Closing Time: 16	"New Market is added." message	As Expected	Pass
10	Add Playground	Side: Left Position: 10 Length: 20 Error: This position is already occupied. This place is already occupied.	"This place is already occupied." message	As Expected	Pass
11	Add House on an already occupied land.	Side: Left Position: 50 Length: 20 Height: 25 Owner: Noone Number of Rooms: 7 Color: Blue	"This place is already occupied." message	As Expected	Pass
12	Add Invalid Playground: Goes beyond the street.	Side: Right Position: 85 Length: 30	"Error: The building is out of bounds. This place is out of bounds." messages	As Expected	Pass
13	Add Playground that starting position is out of the street.	Side: Left Position: 110 Length: 10	"Error: The building is out of bounds. This place is out of bounds." messages	As Expected	Pass
14	Delete Playground	Side: 1(Left) Address: 3	"Building removed." Message	As Expected	Pass
15	Delete Market	Side: 2 Address: 2	"Building removed." Message	As Expected	Pass
16	Display street before and after deletion	Existing Street	Deleted buildings doesnt show up	As Expected	Pass
17	Deleting non-existing building	Side: 2(Right) Address: 5	"Error: Address info is invalid. Invalid building address." messages	As Expected	Pass

18	Deleting non-existing building	Side: 1 (Left) Address: 0	"Error: Address info is invalid. Invalid building address." messages	As Expected	Pass
19	Displaying the total remaining length of lands on the street	Existing Street	Data are 100, 15, 30, 45	As Expected	Pass
20	Basic listing of the buildings	Existing Street	Buildings are listed correctly	As Expected	Pass
21	Detailed listing of the buildings	Existing Street	Buildings are listed correctly	As Expected	Pass
22	Displaying the number and ratio of lenth of playgrounds on the street	Existing Street	Data are 1, 20, 0.1	As Expected	Pass
23	Calculating the total length of street occupied by the markets, houses or offices	Existing Street	Data are 35, 50, 20	As Expected	Pass
24	Draw skyline silhouette	Existing Street	Silhouette is drawen correctly	As Expected	Pass
25	Focusing on a building	All side and address combination of buildings on the street (2x3)	The data are given correctly according to building types	As Expected	Pass
26	Focusing with invalid info	Side: 1(Left) Address: 0	"Error: Invalid building info." message	As Expected	Pass
27	Focusing with invalid info	Side: 1(Left) Address: 5	"Error: Invalid building info." message	As Expected	Pass
28	Navigate in all menu options	Menu selections	Navigate without issue	As Expected	Pass
29	Test all functionalities above in menu as well.	Menu selections and inputs	Functionalities work without issue	As Expected	Pass
30	Enter invalid string type inputs In main menu	string	Program acts if 0 is entered	As Expected	Pass

6. RUNNING AND RESULTS

Driver Function Outputs:

```
HW1 Driver Function
Test setting street size.
Entered street size: 100

------------------------------------------------
Test Adding Buildings
Add Playground
Side: Left
Position: 0
Length: 20
New Playground is added.

Add House
Side: Right
Position: 0
Length: 15
Height: 20
Owner: Ali Bey
Number of Rooms: 5
Color: Green
New House is added.

Add Office
Side: Left
Position: 25
Length: 25
Height: 25
Owner: Veli Bey
Job Type: Law Firm
New Office is added.

Add Market
Side: Right
Position: 15
Length: 10
Height: 10
Owner: Zeynep Hanim
Opening Time: 10
Closing Time: 21
New Market is added.
```

```
Add Playground
Side: Left
Position: 55
Length: 20
New Playground is added.

Add House
Side: Left
Position: 80
Length: 20
Height: 25
Owner: Ahmet Bey
Number of Rooms: 7
Color: Blue
New House is added.

Add Office
Side: Right
Position: 35
Length: 25
Height: 40
Owner: Ayse Hanim
Job Type: Technology Company
New Office is added.

Add Market
Side: Right
Position: 65
Length: 20
Height: 15
Owner: Selim Bey
Opening Time: 8
Closing Time: 16
New Market is added.
------------------------------
```

```
------------------------------------------------
Test adding to an already occupied place

Add Invalid Playground
Side: Left
Position: 10
Length: 20
Error: This position is already occupied.
This place is already occupied.

Add Invalid House
Side: Left
Position: 50
Length: 20
Height: 25
Owner: Noone
Number of Rooms: 7
Color: Blue
Error: This position is already occupied.
------------------------------------------------
```

```
------------------------------------------------------------------
Test Adding Building Out of Bounds

Add Invalid Playground: Goes beyond the street.
Side: Right
Position: 85
Length: 30
Error: The building is out of bounds.
This place is out of bounds.

Add Invalid Playground: Starting position is out of the street.
Side: Left
Position: 110
Length: 10
Error: The building is out of bounds.
This place is out of bounds.
------------------------------------------------------------------
```

```
Test Deleting Building

Left side of the street:
1: Playground
2: Office
3: Playground
4: House

Right side of the street:
1: House
2: Market
3: Office
4: Market


Remove Playground(3) on left.
Building removed.
Remove Market(2) on right
Building removed.

After deletion:

Left side of the street:
1: Playground
2: Office
3: House

Right side of the street:
1: House
2: Office
3: Market
```

```
Test deleting non-existing building
Remove building with address 5 in right side.
Error: Address info is invalid.
Invalid building address.
Remove building with address 0 in left side.
Error: Address info is invalid.
Invalid building address.
```

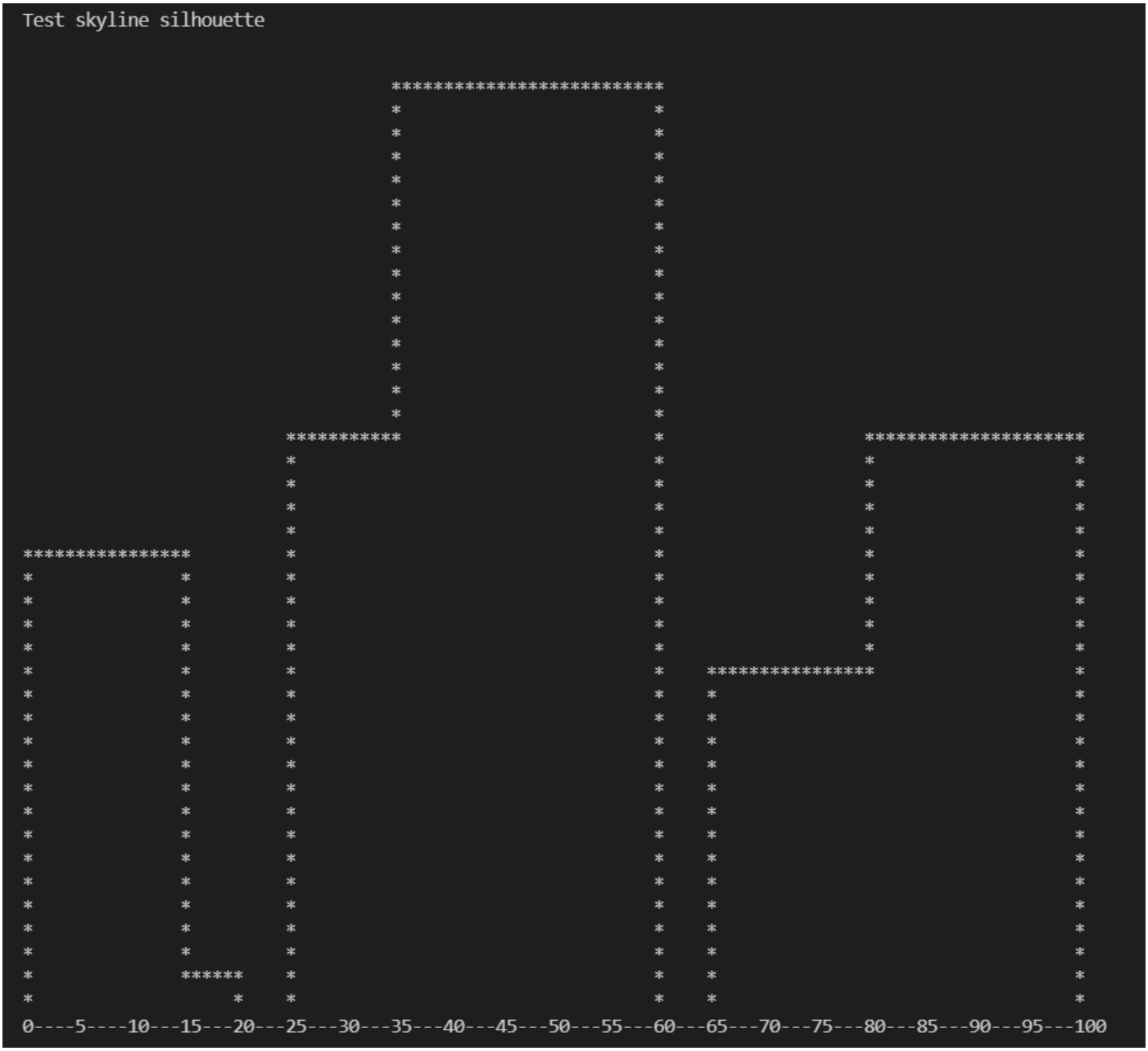
```
Test displaying the total remaining length of lands on the street
Total length of the street: 100
Remaining length on the left side of the street: 15
Remaining length on the right side of the street: 30
Total remaining length on the street: 45
```

```
Test listing all buildings on the street
Basic Listing:

Left side of the street:
1: Playground
2: Office
3: House

Right side of the street:
1: House
2: Office
3: Market
```

```
Detailed Listing:

Left side of the street:
1:--Playground--
Position: 0
Length: 20
Default height: 2

2:--Office--
Position: 25
Length: 25
Height: 25
Owner: Veli Bey
Job Type: Law Firm

3:--House--
Position: 80
Length: 20
Height: 25
Owner: Ahmet Bey
Number of Rooms: 7
Color: Blue

Right side of the street:
1:--House--
Position: 0
Length: 15
Height: 20
Owner: Ali Bey
Number of Rooms: 5
Color: Green

2:--Office--
Position: 35
Length: 25
Height: 40
Owner: Ayse Hanim
Job Type: Technology Company

3:--Market--
Position: 65
Length: 20
Height: 15
Owner: Selim Bey
Opening Time: 8
Closing Time: 16
```

```
Test displaying the number and ratio of lenth of playgrounds on the street
Number of playgrounds on the street: 1
Total length of the playgrounds on the street: 20
Ratio of length of playgrounds on the street: 0.1
```

```
Test calculating the total length of street occupied by the markets, houses or offices
Total length of houses on the street: 35
Total length of offices on the street: 50
Total length of markets on the street: 20
```



Menu Outputs:

Creating new street:

```
Driver function ended.

Enter 1 to continue with interactive program
Enter another number to exit
Selection: 1

Would you like to keep driver function's data or create a new empty street?
Enter 1 to keep existing street
Enter another number to create new street.
Selection: 0


Welcome to Homework 1
Please enter the length of the street(Between 0-150): 120
```

Main Menu:

```
You have a street with a length of 120
Select which mode do you want to enter:
1. Editing Mode
2. Viewing Mode
3. Exit
Selection:
```

Editing Mode Menu:

```
You have selected edit mode.
Select which option do you want to do:
1. Add Building
2. Delete Building
3. Return to the Main Menu
Selection:
```

Test Add Playground

```
You have selected Add Building.
Select which kind of building do you want to add:
1. Playground
2. House
3. Office
4. Market
5. Return to Edit Mode Menu
Selection: 1

You have selected Add Playground
Enter which side do you want to add the playground.
1. Left
2. Right
Side select: 1
Enter playground's position: 0
Enter playground's length: 25
New playground is added.
```

```
You have selected Add Playground
Enter which side do you want to add the playground.
1. Left
2. Right
Side select: 2
Enter playground's position: 100
Enter playground's length: 20
New playground is added.
```

Test Add House

```
You have selected Add House
Enter which side do you want to add the house.
1. Left
2. Right
Side select: 2
Enter house's position: 0
Enter house's length: 30
Enter house's height: 25
Enter the house owner's name: Ali Bey
Enter number of rooms in the room: 5
Enter the house's color: Green
New house is added
```

Test Add Office

```
You have selected Add Office
Enter which side do you want to add the office.
1. Left
2. Right
Side select: 1
Enter office's position: 35
Enter office's length: 30
Enter office's height: 35
Enter the office owner's name: Zeynep Hanim
Enter the job type of the office: Engineering Company
New office is added.
```

```
You have selected Add Office
Enter which side do you want to add the office.
1. Left
2. Right
Side select: 1
Enter office's position: 90
Enter office's length: 25
Enter office's height: 25
Enter the office owner's name: John
Enter the job type of the office: Insurance Company
New office is added.
```

Test Add Market:

```
You have selected Add Market
Enter which side do you want to add the market.
1. Left
2. Right
Side select: 2
Enter market's position: 45
Enter market's length: 40
Enter market's height: 20
Enter the market owner's name: Polat Bey
Enter the market's opening hour (0-24): 8
Enter the market's closing hour (0-24): 20
New market is added.
```

Test Adding Building on an Occupied Land

```
You have selected Add Playground
Enter which side do you want to add the playground.
1. Left
2. Right
Side select: 1
Enter playground's position: 15
Enter playground's length: 20
Error: This position is already occupied.
New playground could not be added.
```

```
You have selected Add Playground
Enter which side do you want to add the playground.
1. Left
2. Right
Side select: 2
Enter playground's position: 50
Enter playground's length: 20
Error: This position is already occupied.
New playground could not be added.
```

Test Adding Building Out of Bounds

```
You have selected Add Playground
Enter which side do you want to add the playground.
1. Left
2. Right
Side select: 2
Enter playground's position: 120
Enter playground's length: 20
Error: The building is out of bounds.
New playground could not be added.
```

Test Delete Building

```
Left side of the street:
1: Playground
2: Office
3: Office

Right side of the street:
1: House
2: Market
3: Playground

Enter which side do you want to delete the building from.
1. Left
2. Right
3. Return to delete select page
Side select: 2
Enter the address of the building you want to delete from the list: 3
The building is deleted.
```

View Mode Menu

```
You have selected view mode.
Select which option do you want to do:
1. Display the total remaining length of lands on the street.
2. Display the list of buildings on the street.
3. Display the number and ratio of lenth of playgrounds in the street.
4. Calculate the total length of street occupied by the markets, houses or offices.
5. Display the skyline silhouette of the street
6. Focus on a building.
7. Return to the Main Menu
Selection:
```

Test Remaining Length of Lands

```
You have selected to display the total remaining length of lands on the street
Total length of the street: 120
Remaining length on the left side of the street: 40
Remaining length on the right side of the street: 30
Total remaining length on the street: 70
Enter any number to return:
```

Test Displaying Detailed List of Buildings

```
You have selected to list buildings on the street.
Do you want to see a detailed list or a basic list?
1. Detailed
2. Basic
Selection: 1
Detailed list of the buildings on the street:

Left side of the street:
1:--Playground--
Position: 0
Length: 25
Default height: 2

2:--Office--
Position: 35
Length: 30
Height: 35
Owner: Zeynep Hanim
Job Type: Engineering Company

3:--Office--
Position: 90
Length: 25
Height: 25
Owner: John
Job Type: Insurance Company

Right side of the street:
1:--House--
Position: 0
Length: 30
Height: 25
Owner: Ali Bey
Number of Rooms: 5
Color: Green

2:--Market--
Position: 45
Length: 40
Height: 20
Owner: Polat Bey
Opening Time: 8
Closing Time: 20
Enter any number to return:
```

,

Test Basic List of Buildings

```
You have selected to list buildings on the street.
Do you want to see a detailed list or a basic list?
1. Detailed
2. Basic
Selection: 2
Basic list of the buildings on the street:

Left side of the street:
1: Playground
2: Office
3: Office

Right side of the street:
1: House
2: Market

Enter any number to return:
```

Test display the number and ratio of lenth of playgrounds in the street

```
You have selected to display the number and ratio of lenth of playgrounds in the street.
Number of playgrounds on the street: 1
Total length of the playgrounds on the street: 25
Ratio of length of playgrounds on the street: 0.10416666666666667
Enter any number to continue:
```

Test calculate the total length of street occupied by the markets, houses or offices

```
You have selected to calculate the total length of street occupied by the markets, houses or offices.
Total length of houses on the street: 30
Total length of offices on the street: 55
Total length of markets on the street: 40
Enter any number to return:
```

Test focus on Playground

```
You have selected to focus on a building.

Left side of the street:
1: Playground
2: Office
3: Office

Right side of the street:
1: House
2: Market

Select a building from the list
Select the side of the building:
1. Left
2. Right
Selection:1
Enter the address of the building: 1
You focus on this playground and see its length is 25
Enter a number to continue:
```

Test focus on Office

```
Select a building from the list
Select the side of the building:
1. Left
2. Right
Selection:1
Enter the address of the building: 2
You focus on this office and see its job type is Engineering Company
Enter a number to continue:
```

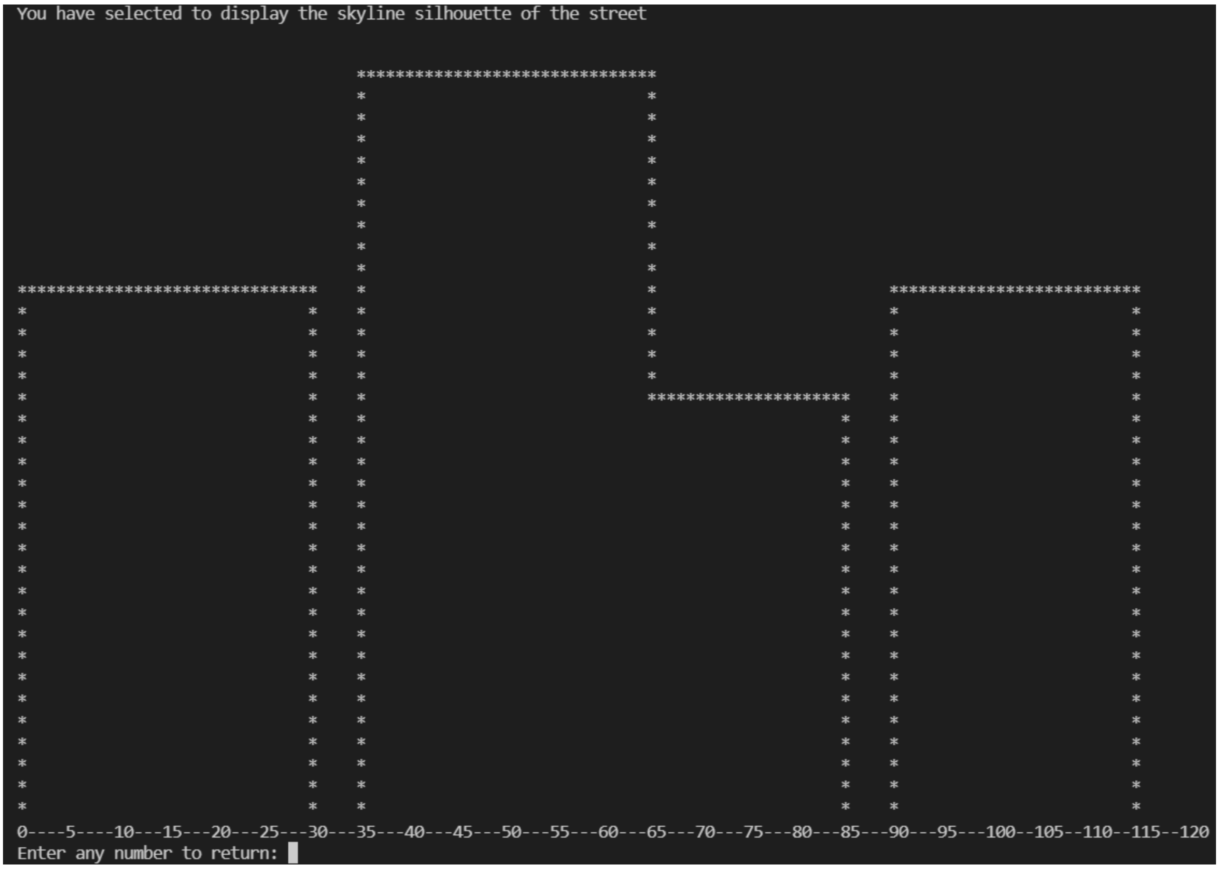
Test focus on House

```
Select a building from the list
Select the side of the building:
1. Left
2. Right
Selection:2
Enter the address of the building: 1
You focus on this house and see it's owner is Ali Bey
Enter a number to continue:
```

Test focus on Market

```
Select a building from the list
Select the side of the building:
1. Left
2. Right
Selection:2
Enter the address of the building: 2
You focus on this market and see its closing time is 20
Enter a number to continue:
```

Test Skyline Silhouette



Add 2 New Buildings

```
You have selected Add Office
Enter which side do you want to add the office.
1. Left
2. Right
Side select: 1
Enter office's position: 25
Enter office's length: 10
Enter office's height: 15
Enter the office owner's name: Ayse Hanim
Enter the job type of the office: Law Firm
New office is added.
```

```
You have selected Add Playground
Enter which side do you want to add the playground.
1. Left
2. Right
Side select: 1
Enter playground's position: 80
Enter playground's length: 10
New playground is added.
```

Test New Skyline Silhouette