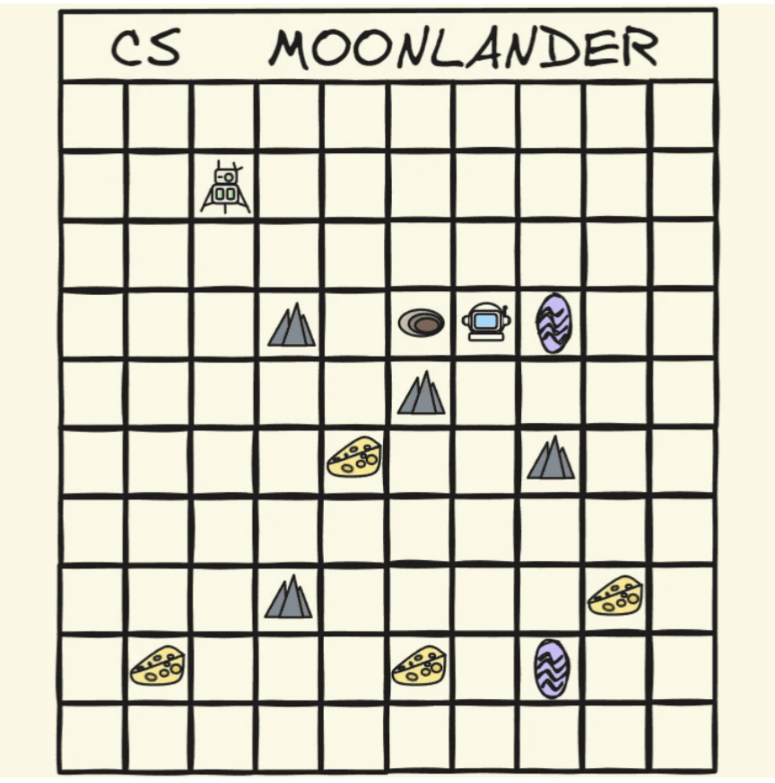
Moonlander

Overview



Moonlander is a small game where the player enters commands to move an astronaut around the moon to collect moon cheese, without running out of oxygen.

The aim of the game is to collect some target amount of cheese and make it back to the lander to export the moon cheese back to Earth! Movement has an oxygen cost and to collect the cheese we may have to navigate around rocks and avoid running out of oxygen completely (a player can drop off cheese and refill their oxygen tank at the lander).

We will begin by setting up the board, then add the ability to move around it to play the game and in the final few stages we will also implement moonquakes and some more interesting methods of travel but we will leave that as a surprise for the moment...

Getting Started

1. Create a new folder for your assignment. Here is an example:

```
$ mkdir ass1
$ cd ass1
```

2. Fetch the starter code using the command below. Alternatively download the starter code here.

```
$ 1091 fetch-activity cs_moonlander
```

3. Check that everything works by running the autotest.

```
$ 1091 autotest cs_moonlander
```

(These should fail initially. If you want to exit running the autotest midway, press `[ctrl-c]`)

Initial Code and Data Structures

The starter code for this assignment includes some functions and defined types:

- A `print_board()` function:
    - This prints out the current state of the board, which ensures that your board printing matches the autotest exactly for a given board.
- An `init_board()` function:
    - This stores a default value in each of the tiles in the provided board.
- A `struct tile` struct:
    - Each square of the board (i.e. the 2D array) holds a `struct tile` , containing the information about what that tile contains.
    - The player's row and col values are stored seperately to the contents of the board
- An `enum entity` enum:
    - This is used in the `struct tile` struct to represent what is on each tile.

Let us look at an example output from the `print_board()` function.

```
+---+---+---+---+---+---+---+---+---+---+
|       C S   M O O N L A N D E R       |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
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|   |   |/|\|   |^^^|   |<(]|   |   |   |
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|   |   |   |   |   |   |0.0|   |   |   |
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```

Here, we have tiles containing:

- the lander `/|\`
- a rock `^^^`
- a cheese `<(]`
- a hole down `\O/`
- two portals `~~~`
- the player `0.0`

Where do we store the player?

The player is not stored in the `board`, instead the `print_board()` function takes the player's row and column as arguments whenever we print the board.

- for the above example: `print_board(board, 4, 6);`.

So you can store the player however you like! (e.g. variables for the row/col, or perhaps a struct that contains both the row and the col!)

Reference Implementation

To help you understand how the assignment works, we have written a reference implementation for you to run. You can run it via the command `1091 cs_moonlander`.

```
$ 1091 cs_moonlander
...
```

+ Example Input

FAQ

+ FAQ

Stages

We have broken the assignment spec down into incremental stages:

- **Stage 1:** Place the lander, add cheese & rocks to the board.

- **Stage 2:** Setup the player, add player movement, pick up and drop off cheese, keep oxygen levels correctly updated, refill oxygen at the lander.
- **Stage 3:** Check for a win or lose condition, add a command to quit the program early, add moonquake mechanics.
- **Stage 4:** Make the board 3D, add commands to create holes and jump between levels, add portals, implement travelling through portals.
- **Extension (no marks):** Add a graphical user interface.

Your Tasks

This assignment consists of four stages. Each stage builds on the work of the previous stage, and each stage has a higher complexity than its predecessor. You should complete the stages in order.

Stage 1 ●○○ Stage 2 ●○○ Stage 3 ●●○ Stage 4 ●●● Extension Tools

Stage 2

In stage 2, you will setup the player, implement player movement, the oxygen consumption (turn) system and picking up and dropping off cheese at the lander.

We implement the beginnings of the turn system in this stage. When the player moves, they use up a certain amount of oxygen, decreasing their tank level by that much. That amount starts as 1.0 but may change in later stages. If a player attempts an action that would decrease their oxygen amount, but they cannot complete that action, no oxygen decrement occurs for that turn (i.e. attempting to move onto a rock).

When we implement winning or losing the game and lander interactions (refill oxygen, drop off cheese), the order of operations for any single *turn* becomes important. They are as follows, in order:

1. Any preconditions for the action are checked
   - If the action cannot be performed (i.e. moving onto a rock), it does not count as a turn and nothing else happens this turn except printing the board.
2. The action is taken and any effects are carried out
   - I.e. player moves, picks up cheese and decreases oxygen level
3. Check for and execute lander interactions if available
   - Lander interactions happen when the player is on one of the 8 tiles that surround the lander
   - Lander interactions will consist of refilling the oxygen level, repairing suit leaks and dropping off held cheese
4. Check for win/lose conditions
   - Including printing win/lose message and exiting the program (stage 3.1)
5. If the command was not recognised you should print `Command not recognised!\n` (stage 2.2), otherwise call the `print_board()` function.

> NOTE:
>
> While in many cases getting this order wrong will not change the output, there are some cases where it will result in failed tests.

Here is an example of input for a finished stage 2 that you can try on the reference implementation.

```
3 3
c 3 4
c 2 8
q
3
20
2 9
x
a
a
a
s
a
a
a
[ctrl+d]
```

Stage 2.1: Setting up the player

The last bit of initialisation is to scan in the target amount of cheese, the player's oxygen tank capacity, and the player's starting tile.

In this substage, you will need to do the following:

1. Edit the setup command loop to end when `COMMAND_QUIT` is entered, rather than `[ctrl+d]` . This means that after the player has placed all the cheese and rocks, they will have to enter `COMMAND_QUIT` in order to enter the player setup phase below.
    - The reason for this change is that once `[ctrl+d]` is entered, C will not scan any further inputs, meaning we can not play the game.
2. Ask for a target quantity of cheese.
    - Use the prompt `Please enter the target qty of cheese: ` .
    - Scan in the target quantity of cheese to collect as an int.
    - If the target quantity of cheese is less than 0, print `The target qty of cheese must be >= 0!\n` and scan again, repeating until a valid input is entered.
3. Ask for the oxygen tank capacity of the player.
    - Use the prompt `Please enter the player's oxygen tank capacity: ` .
    - Scan in the player's tank capacity as a double.
    - If the scanned tank capacity is less than 0, print `The oxygen tank capacity must be >= 0!\n` and scan again, repeating until a valid input is entered.
4. Ask for the player's starting position.
    - Use the prompt `Please enter the [row] [col] of the player: ` .
    - Scan in the `[row] [col]` of the player as ints.
    - If the requested tile is not in bounds of the map or is occupied, print `That is not a valid player placement!\n` , repeating until a valid starting position is entered.
5. Print the message `<->        STARTING MOONLANDER        <->\n` .
6. Print the board using the provided `print_board()` function.
    - From now on, instead of using default values in the `print_board()` function, use the current values of:
        - the player's row and column
        - amount of cheese the player and lander hold (starts at `0`)
        - oxygen capacity
        - oxygen level (starts at capacity)
        - oxygen rate (starts as `BASE_OXY_RATE`)

Clarifications

- The target quantity of cheese, player row and col, will always be ints.
- The tank capacity will always be a double.
- When using the reference solution, after the board prints, enter `[ctrl+d]` to match what your program should do.

Examples

– Example 2.1.1: Adding Player

Input:

```
3 8
q
2
10
4 9
[ctrl+d]
```

Input and Output:

```
$ dcc cs_moonlander.c -o cs_moonlander
$ ./cs_moonlander
Please enter the [row] [col] of the lander: 3 8
+---+---+---+---+---+---+---+---+---+---+
|       C S   M O O N L A N D E R       |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
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|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
Player Cheese: 0     Lander Cheese: 0
Oxy: 0.00 / 0.00  @  1.000000 / move
+---+---+---+---+---+---+---+---+---+---+
Please enter cheese and rock locations:
q
+---+---+---+---+---+---+---+---+---+---+
|       C S   M O O N L A N D E R       |
+---+---+---+---+---+---+---+---+---+---+
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|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
Player Cheese: 0     Lander Cheese: 0
Oxy: 0.00 / 0.00  @  1.000000 / move
+---+---+---+---+---+---+---+---+---+---+
Please enter the target qty of cheese: 2
Please enter the player's oxygen tank capacity: 10
Please enter the [row] [col] of the player: 4 9
<->        STARTING MOONLANDER        <->
+---+---+---+---+---+---+---+---+---+---+
|       C S   M O O N L A N D E R       |
+---+---+---+---+---+---+---+---+---+---+
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|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
Player Cheese: 0     Lander Cheese: 0
Oxy: 10.00 / 10.00  @  1.000000 / move
+---+---+---+---+---+---+---+---+---+---+
```

– Example 2.1.2: Adding Player Out of Bounds

Input:

```
1 5
r 4 4
c 5 6
q
2
10
-1 3
1 -7
10 7
8 32
1 5
4 4
5 6
6 6
[ctrl+d]
```

Input and Output:

```
$ dcc cs_moonlander.c -o cs_moonlander
$ ./cs_moonlander
Please enter the [row] [col] of the lander: 1 5
+---+---+---+---+---+---+---+---+---+---+
|       C S   M O O N L A N D E R       |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
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|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
Player Cheese: 0     Lander Cheese: 0
Oxy: 0.00 / 0.00  @  1.000000 / move
+---+---+---+---+---+---+---+---+---+---+
Please enter cheese and rock locations:
r 4 4
c 5 6
q
+---+---+---+---+---+---+---+---+---+---+
|       C S   M O O N L A N D E R       |
+---+---+---+---+---+---+---+---+---+---+
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Player Cheese: 0     Lander Cheese: 0
Oxy: 0.00 / 0.00  @  1.000000 / move
+---+---+---+---+---+---+---+---+---+---+
Please enter the target qty of cheese: 2
Please enter the player's oxygen tank capacity: 10
Please enter the [row] [col] of the player: -1 3
That is not a valid player placement!
1 -7
That is not a valid player placement!
10 7
That is not a valid player placement!
8 32
That is not a valid player placement!
1 5
That is not a valid player placement!
```

```
4 4
That is not a valid player placement!
5 6
That is not a valid player placement!
6 6
<->        STARTING MOONLANDER        <->
+---+---+---+---+---+---+---+---+---+---+
|       C S   M O O N L A N D E R       |
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|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
Player Cheese: 0     Lander Cheese: 0
Oxy: 10.00 / 10.00  @  1.000000 / move
+---+---+---+---+---+---+---+---+---+---+
```

– Example 2.1.3: Player Stat Errors

Input:

```
1 5
q
-1
1
-3
5.2
6 6
[ctrl+d]
```

Input and Output:

```
$ dcc cs_moonlander.c -o cs_moonlander
$ ./cs_moonlander
1 5
+---+---+---+---+---+---+---+---+---+---+
|       C S   M O O N L A N D E R       |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
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|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
Player Cheese: 0     Lander Cheese: 0
Oxy: 0.00 / 0.00  @  1.000000 / move
+---+---+---+---+---+---+---+---+---+---+
Please enter cheese and rock locations:
q
+---+---+---+---+---+---+---+---+---+---+
|       C S   M O O N L A N D E R       |
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|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
Player Cheese: 0     Lander Cheese: 0
Oxy: 0.00 / 0.00  @  1.000000 / move
+---+---+---+---+---+---+---+---+---+---+
-1
The target qty of cheese must be >= 0!
1
Please enter the player's oxygen tank capacity: -3
The oxygen tank capacity must be >= 0!
5.2
Please enter the [row] [col] of the player: 6 6
<->        STARTING MOONLANDER        <->
+---+---+---+---+---+---+---+---+---+---+
|       C S   M O O N L A N D E R       |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |/|\|   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |0.0|   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
Player Cheese: 0     Lander Cheese: 0
Oxy: 5.20 / 5.20  @  1.000000 / move
+---+---+---+---+---+---+---+---+---+---+
```

Autotest

NOTE:

You may like to autotest this section with the following command:

```
1091 autotest-stage 02_01 cs_moonlander
```

Remember to do your own testing!

Stage 2.2: Command loop, Player movement

This substage sets up the gameplay command loop for the rest of the game, after this most of what we will be doing is extending it to cover more user commands.

We will also implement the first set of commands here, those used to move the player around the board.

In this substage, you will need to do the following:

1. Construct a main command loop that scans commands (`char` followed by optional other inputs depending on the command) and executes them.
    - When a unknown command character is entered, print `Command not recognised!\n`
2. When the commands `w` , `a` , `s` , `d` are entered, move the player onto the square above, left, below or right respectively, of their current position.
    - Call the `print_board()` function after each command
    - Each time the player moves, their oxygen level should be decreased by the oxygen rate (starts at `BASE_OXY_RATE`)
3. When `[ctrl+d]` is pressed, exit the program without any further scanning or printing

Clarifications

- The first input of every command will be either `[ctrl+d]` or a `char`

Examples:

– Example 2.2.1: Move Player

Input:

```
0 1
q
2
10
0 5
d
s
a
w
[ctrl+d]
```

Input and Output:

```
$ dcc cs_moonlander.c -o cs_moonlander
$ ./cs_moonlander
Please enter the [row] [col] of the lander: 0 1
+---+---+---+---+---+---+---+---+---+---+
|       C S   M O O N L A N D E R       |
+---+---+---+---+---+---+---+---+---+---+
|   |/|\|   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
Player Cheese: 0     Lander Cheese: 0
Oxy: 0.00 / 0.00  @  1.000000 / move
+---+---+---+---+---+---+---+---+---+---+
Please enter cheese and rock locations:
q
+---+---+---+---+---+---+---+---+---+---+
|       C S   M O O N L A N D E R       |
+---+---+---+---+---+---+---+---+---+---+
|   |/|\|   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
Player Cheese: 0     Lander Cheese: 0
Oxy: 0.00 / 0.00  @  1.000000 / move
+---+---+---+---+---+---+---+---+---+---+
2
10
0 5
<->        STARTING MOONLANDER        <->
+---+---+---+---+---+---+---+---+---+---+
|       C S   M O O N L A N D E R       |
+---+---+---+---+---+---+---+---+---+---+
|   |/|\|   |   |   |0.0|   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
Player Cheese: 0     Lander Cheese: 0
Oxy: 10.00 / 10.00  @  1.000000 / move
+---+---+---+---+---+---+---+---+---+---+
d
+---+---+---+---+---+---+---+---+---+---+
|       C S   M O O N L A N D E R       |
+---+---+---+---+---+---+---+---+---+---+
|   |/|\|   |   |   |   |0.0|   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
Player Cheese: 0     Lander Cheese: 0
Oxy: 9.00 / 10.00  @  1.000000 / move
+---+---+---+---+---+---+---+---+---+---+
s
+---+---+---+---+---+---+---+---+---+---+
|       C S   M O O N L A N D E R       |
+---+---+---+---+---+---+---+---+---+---+
|   |/|\|   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |0.0|   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
Player Cheese: 0     Lander Cheese: 0
Oxy: 8.00 / 10.00  @  1.000000 / move
+---+---+---+---+---+---+---+---+---+---+
a
+---+---+---+---+---+---+---+---+---+---+
|       C S   M O O N L A N D E R       |
+---+---+---+---+---+---+---+---+---+---+
|   |/|\|   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |0.0|   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
Player Cheese: 0     Lander Cheese: 0
Oxy: 7.00 / 10.00  @  1.000000 / move
+---+---+---+---+---+---+---+---+---+---+
w
+---+---+---+---+---+---+---+---+---+---+
|       C S   M O O N L A N D E R       |
+---+---+---+---+---+---+---+---+---+---+
|   |/|\|   |   |   |0.0|   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
Player Cheese: 0     Lander Cheese: 0
Oxy: 6.00 / 10.00  @  1.000000 / move
+---+---+---+---+---+---+---+---+---+---+
```

– Example 2.2.2: Unknown Command

Input:

```
0 1
q
4
10.2
0 5
x
[ctrl+d]
```

Input and Output:

```
$ dcc cs_moonlander.c -o cs_moonlander
$ ./cs_moonlander
Please enter the [row] [col] of the lander: 0 1
+---+---+---+---+---+---+---+---+---+---+
|       C S   M O O N L A N D E R       |
+---+---+---+---+---+---+---+---+---+---+
|   |/|\|   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
Player Cheese: 0     Lander Cheese: 0
Oxy: 0.00 / 0.00  @  1.000000 / move
+---+---+---+---+---+---+---+---+---+---+
Please enter cheese and rock locations:
q
+---+---+---+---+---+---+---+---+---+---+
|       C S   M O O N L A N D E R       |
+---+---+---+---+---+---+---+---+---+---+
|   |/|\|   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
Player Cheese: 0     Lander Cheese: 0
Oxy: 0.00 / 0.00  @  1.000000 / move
+---+---+---+---+---+---+---+---+---+---+
Please enter the target qty of cheese: 4
Please enter the player's oxygen tank capacity: 10.2
Please enter the [row] [col] of the player: 0 5
<->        STARTING MOONLANDER        <->
+---+---+---+---+---+---+---+---+---+---+
|       C S   M O O N L A N D E R       |
+---+---+---+---+---+---+---+---+---+---+
|   |/|\|   |   |   |0.0|   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
Player Cheese: 0     Lander Cheese: 0
Oxy: 10.20 / 10.20  @  1.000000 / move
+---+---+---+---+---+---+---+---+---+---+
x
Command not recognised!
```

Autotest

NOTE:

You may like to autotest this section with the following command:

```
1091 autotest-stage 02_02 cs_moonlander
```

Remember to do your own testing!

Stage 2.3: Movement Collision and Refilling Oxygen

Now when we move the player, we will have to assert that the target tile can be moved onto. A tile can be moved onto if it is on the board and there is not a rock or the lander on it already.

We will also add the ability to refill the player's oxygen level back to the full tank capacity at the lander. The tank is refilled if the player ends their turn in one of the 8 tiles adjacent to the lander.

In this substage, you will need to do the following:

1. Check whether the tile in the corresponding direction is free to walk on before moving.
    - Tiles off the board, tiles containing the lander or tiles with rocks cannot be moved onto.
    - If they can, the player moves to the target tile.
2. If the player moved, decrement their oxygen tank level by the current oxygen rate (starts at `BASE_OXY_RATE`).
3. If the player is within 1 tile of the lander in both the vertical and horizontal directions (i.e. in one of the eight tiles directly surrounding the lander), their oxygen level is refilled to the tank capacity.

Clarifications

- We will handle the case when the player has no oxygen in stage 3.1 when win/lose conditions are implemented, this case will not be tested until then.

Examples:

– Example 2.3.1: Move Boundaries and Refill

Input:

```
2 2
r 0 3
q
3
100
0 0
w
a
d
d
d
s
s
[ctrl+d]
```

Input and Output:

```
$ dcc cs_moonlander.c -o cs_moonlander
$ ./cs_moonlander
Please enter the [row] [col] of the lander: 2 2
+---+---+---+---+---+---+---+---+---+---+
|       C S   M O O N L A N D E R       |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |/|\|   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
Player Cheese: 0     Lander Cheese: 0
Oxy: 0.00 / 0.00  @  1.000000 / move
+---+---+---+---+---+---+---+---+---+---+
Please enter cheese and rock locations:
r 0 3
q
+---+---+---+---+---+---+---+---+---+---+
|       C S   M O O N L A N D E R       |
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|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
Player Cheese: 0     Lander Cheese: 0
Oxy: 0.00 / 0.00  @  1.000000 / move
+---+---+---+---+---+---+---+---+---+---+
Please enter the target qty of cheese: 3
Please enter the player's oxygen tank capacity: 100
Please enter the [row] [col] of the player: 0 0
+---+---+---+---+---+---+---+---+---+---+
|       C S   M O O N L A N D E R       |
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+---+---+---+---+---+---+---+---+---+---+
Player Cheese: 0     Lander Cheese: 0
Oxy: 100.00 / 100.00  @  1.000000 / move
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w
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|      C S   M O O N L A N D E R        |
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Player Cheese: 0     Lander Cheese: 0
Oxy: 100.00 / 100.00  @  1.000000 / move
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Player Cheese: 0     Lander Cheese: 0
Oxy: 100.00 / 100.00  @  1.000000 / move
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+---+---+---+---+---+---+---+---+---+---+
Player Cheese: 0     Lander Cheese: 0
Oxy: 99.00 / 100.00  @  1.000000 / move
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+---+---+---+---+---+---+---+---+---+---+
Player Cheese: 0     Lander Cheese: 0
Oxy: 98.00 / 100.00  @  1.000000 / move
+---+---+---+---+---+---+---+---+---+---+
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|       C S   M O O N L A N D E R       |
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|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
Player Cheese: 0     Lander Cheese: 0
Oxy: 98.00 / 100.00  @  1.000000 / move
+---+---+---+---+---+---+---+---+---+---+
s
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|       C S   M O O N L A N D E R       |
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+---+---+---+---+---+---+---+---+---+---+
Player Cheese: 0     Lander Cheese: 0
Oxy: 100.00 / 100.00  @  1.000000 / move
+---+---+---+---+---+---+---+---+---+---+
s
+---+---+---+---+---+---+---+---+---+---+
|       C S   M O O N L A N D E R       |
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|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
Player Cheese: 0     Lander Cheese: 0
Oxy: 100.00 / 100.00  @  1.000000 / move
+---+---+---+---+---+---+---+---+---+---+
```

Autotest

NOTE:

You may like to autotest this section with the following command:

```
1091 autotest-stage 02_03 cs_moonlander
```

Remember to do your own testing!

Stage 2.4: Pick up and drop off cheese

In this substage, you will need to do the following:

1. Whenever the player moves onto a tile containing a piece of cheese:
    - Add a unit of cheese to the player's total.
    - Remove the cheese from the tile.
2. If the player is in one of the eight tiles directly surrounding the lander, transfer all cheese they are holding onto the lander (at the same time as refilling their oxygen).

Examples

– Example 2.4.1: Pick up cheese

Input:

```
7 7
c 6 6
c 5 6
c 5 5
c 5 4
c 4 4
q
8
20
4 3
d
s
d
d
s
[ctrl+d]
```

Input and Output:

```
$ dcc cs_moonlander.c -o cs_moonlander
$ ./cs_moonlander
Please enter the [row] [col] of the lander: 7 7
+---+---+---+---+---+---+---+---+---+---+
|       C S   M O O N L A N D E R       |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
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|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
Player Cheese: 0     Lander Cheese: 0
Oxy: 0.00 / 0.00  @  1.000000 / move
+---+---+---+---+---+---+---+---+---+---+
Please enter cheese and rock locations:
c 6 6
c 5 6
c 5 5
c 5 4
c 4 4
q
+---+---+---+---+---+---+---+---+---+---+
|       C S   M O O N L A N D E R       |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |
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|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
Player Cheese: 0     Lander Cheese: 0
Oxy: 0.00 / 0.00  @  1.000000 / move
+---+---+---+---+---+---+---+---+---+---+
Please enter the target qty of cheese: 8
Please enter the player's oxygen tank capacity: 20
Please enter the [row] [col] of the player: 4 3
<->        STARTING MOONLANDER        <->
+---+---+---+---+---+---+---+---+---+---+
|       C S   M O O N L A N D E R       |
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|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
Player Cheese: 0     Lander Cheese: 0
Oxy: 20.00 / 20.00  @  1.000000 / move
+---+---+---+---+---+---+---+---+---+---+
d
+---+---+---+---+---+---+---+---+---+---+
|       C S   M O O N L A N D E R       |
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|   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
Player Cheese: 1     Lander Cheese: 0
Oxy: 19.00 / 20.00  @  1.000000 / move
+---+---+---+---+---+---+---+---+---+---+
s
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Player Cheese: 3     Lander Cheese: 0
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Player Cheese: 4     Lander Cheese: 0
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Player Cheese: 0     Lander Cheese: 5
Oxy: 20.00 / 20.00  @  1.000000 / move
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```

Autotest

NOTE:

You may like to autotest this section with the following command:

```
1091 autotest-stage 02_04 cs_moonlander
```

Remember to do your own testing!

Testing and Submission

Are you finished with this stage? If so, you should make sure to do the following:

- Run `1091 style` , and clean up any issues a human may have reading your code. Don't forget -- **20%** of your mark in the assignment is based on style!
- Autotest for this stage of the assignment by running the `autotest-stage` command as shown below.
- Remember -- *give early, and give often*. Only your last submission counts, but why not be safe and submit right now?

```
1091 style cs_moonlander.c
1091 autotest-stage 02 cs_moonlander
give dp1091 ass1_cs_moonlander cs_moonlander.c
```

Assessment

Assignment Conditions

- **Joint work** is **not permitted** on this assignment.

  This is an individual assignment.

  The work you submit must be entirely your own work. Submission of any work even partly written by any other person is not permitted.

  Except, you may use small amounts (< 10 lines) of general purpose code (not specific to the assignment) obtained from a site such as Stack Overflow or other publicly available resources. You should attribute clearly the source of this code in an accompanying comment.

  Assignment submissions will be examined, both automatically and manually for work written by others.

  Do not request help from anyone other than the teaching staff of DPST1091/CPTG1391, e.g. in the course forum & help sessions.

  Do not post your assignment code to the course forum - the teaching staff can view assignment code you have recently autotested or submitted with give.

Rationale: this assignment is designed to develop the individual skills needed to produce an entire working program. Using code written by or taken from other people will stop you learning these skills. Other CSE courses focus on the skill needed for work in a team.

- The use of **code-synthesis tools**, such as **GitHub Copilot**, is **not permitted** on this assignment.

  The use of **Generative AI** to generate code solutions is not permitted on this assignment.

  Rationale: this assignment is intended to develop your understanding of basic concepts. Using synthesis tools will stop you learning these fundamental concepts.

- **Sharing, publishing, distributing** your assignment work is **not permitted**.

  Do not provide or show your assignment work to any other person other than the teaching staff of DPST1091/CPTG1391. For example, do not message your work to friends.

  Do not publish your assignment code via the internet. For example, do not place your assignment in a public GitHub repository.

  Rationale: by publishing or sharing your work you are facilitating other students using your work which is not permitted. If they submit your work, you may become involved in an academic integrity investigation.

- **Sharing, publishing, distributing your assignment work after the completion of DPST1091/CPTG1391** is **not permitted**.

  For example, do not place your assignment in a public GitHub repository after DPST1091/CPTG1391 is over.

  Rationale: DPST1091/CPTG1391 sometimes reuses assignment themes using similar concepts and content. Students in future terms find your code and use it which is not permitted and you may become involved in an academic integrity investigation.

Violation of the above conditions may result in an academic integrity investigation with possible penalties, up to and including a mark of 0 in DPST1091/CPTG1391 and exclusion from UNSW.

Relevant scholarship authorities will be informed if students holding scholarships are involved in an incident of plagiarism or other misconduct. If you knowingly provide or show your assignment work to another person for any reason, and work derived from it is submitted you may be penalised, even if the work was submitted without your knowledge or consent. This may apply even if your work is submitted by a third party unknown to you.

Note, you will not be penalised if your work is taken without your consent or knowledge.

For more information, read the UNSW Student Code, or contact the course account. The following penalties apply to your total mark for plagiarism:

0 for the assignment	Knowingly providing your work to anyone and it is subsequently submitted (by anyone).
0 for the assignment	Submitting any other person's work. This includes joint work.
0 FL for DPST1091	Paying another person to complete work. Submitting another person's work without their consent.

Submission of Work

You should submit intermediate versions of your assignment. Every time you autotest or submit, a copy will be saved as a backup. You can find those backups here, by logging in, and choosing the yellow button next to 'cs_moonlander.c'.

Every time you work on the assignment and make some progress you should copy your work to your CSE account and submit it using the `give` command below.

It is fine if intermediate versions do not compile or otherwise fail submission tests.

Only the final submitted version of your assignment will be marked.

You submit your work like this:

```
$ give dp1091 ass1_cs_moonlander cs_moonlander.c
```

Assessment Scheme

This assignment will contribute 20% to your final mark.

80% of the marks for this assignment will be based on the performance of the code you write in `cs_moonlander.c`

20% of the marks for this assignment will come from manual marking of the readability of the C you have written. The manual marking will involve checking your code for clarity, and readability, which includes the use of functions and efficient use of loops and if statements.

Marks for your performance will be allocated roughly according to the below scheme.

100% for Performance	Completely Working Implementation, which exactly follows the spec (Stage 1, 2, 3 and 4).
85% for Performance	Completely working implementation of Stage 1, 2 and 3.
65% for Performance	Completely working implementation of Stage 1 and Stage 2.
35% for Performance	Completely working implementation of Stage 1.

The Challenge stage of the assignment is NOT worth any marks, but is something fun for you to work on getting to know a new library and building something more visual!

Style Marking Rubric

	0	1	2	3	4
Formatting (/5)					
Indentation (/2) - Should use a consistent indentation scheme.	Multiple instances throughout code of inconsistent/bad indentation	Code is mostly correctly indented	Code is consistently indented throughout the program		
Whitespace (/1) - Should use consistent whitespace (for example, 3 + 3 not 3+ 3)	Many whitespace errors	No whitespace errors			
Vertical Whitespace (/1) - Should use consistent whitespace (for example, vertical whitespace between sections of code)	Code has no consideration for use of vertical whitespace	Code consistently uses reasonable vertical whitespace			
Line Length (/1) - Lines should be max. 80 characters long	Many lines over 80 characters	No lines over 80 characters			
Documentation (/5)					
Comments (incl. header comment) (/3) - Comments have been used throughout the code above code sections and functions to explain their purpose. A header comment (with name, zID and a program description) has been included	No comments provided throughout code	Few comments provided throughout code	Comments are provided as needed, but some details or explanations may be missing causing the code to be difficult to follow	Comments have been used throughout the code above code sections and functions to explain their purpose. A header comment (with name, zID and a program description) has been included	
Function/variable/constant naming (/2) - Functions/variables/constants names all follow naming conventions in style guide and help in understanding the code	Functions/variables/constants names do not follow naming conventions in style guide and help in understanding the code	Functions/variables/constants names somewhat follow naming conventions in style guide and help in understanding the code	Functions/variables/constants names all follow naming conventions in style guide and help in understanding the code		
Organisation (/5)					

Function Usage (/4) - Code has been decomposed into appropriate functions separating functionalities	No functions are present, code is one main function	Some code has been moved to functions	Some code has been moved to sensible/thought out functions, and/or many functions exceed 50 lines (incl. main function)	Most code has been moved to sensible/thought out functions, and/or some functions exceed 50 lines (incl. main function)	All code h been meaningfu decompos into functions a maximu of 50 lines (incl. The main function)
Function Prototypes (/1) - Function Prototypes have been used to declare functions above main	Functions are used but have not been prototyped	All functions have a prototype above the main function or no functions are used			
Elegance (/5)					
Overdeep nesting (/2) - You should not have too many levels of nesting in your code (nesting which is 5 or more levels deep)	Many instances of overdeep nesting	<= 3 instances of overdeep nesting	No instances of overdeep nesting		
Code Repetition (/2) - Potential repetition of code has been dealt with via the use of functions or loops	Many instances of repeated code sections	<= 3 instances of repeated code sections	Potential repetition of code has been dealt with via the use of functions or loops		
Constant Usage (/1) - Any magic numbers are #defined	None of the constants used throughout program are #defined	All constants used are #defined and are used consistently in the code			
Illegal elements					
Illegal elements - Presence of any illegal elements indicated in the style guide	**CAP MARK AT 16/20**				

Allowed C Features

In this assignment, there are no restrictions on C Features, except for those in the style guide. If you choose to disregard this advice, you **must** still follow the style guide.

You also may be unable to get help from course staff if you use features not taught in DPST1091. Features that the Style Guide identifies as illegal will result in a penalty during marking. You can find the style marking rubric above.

Due Date

This assignment is due **Week 8 Friday 09:00am** (2025-03-14 09:00:00). For each day after that time, the maximum mark it can achieve will be reduced **by 5%** (off the ceiling). For example at:

- Less than 1 day (24 hours) past the due date, the maximum mark you can get is **95%**.
- Less than 2 days (48 hours) past the due date, the maximum mark you can get is **90%**.
- Less than 5 days (120 hours) past the due date, the maximum mark you can get is **75%**.

No submissions will be accepted at 5 days late, unless you have special provisions in place.

Change Log

Version 1.0
(2025-02-21 09:00)

- Assignment Released

DPST1091/CPTG1391 25T1: Programming Fundamentals!