

MAT 2440 Assignment #5

This assignment is due on XX/XX/20XX at 10 am - at the beginning of our class period. You may submit it electronically as a pdf document or as a hard copy. Assignments late by 1 day will be penalized by 25%, 2 days late 50%, 3 days late 75% and any later they will no longer be accepted.

Please be sure this writing is your own - do NOT borrow from a friend. I want to hear your own voice, not read a copy and paste of some other source!!!

In this project we will explore some big- O estimates for different algorithms.

Suppose you have a lamplighter that you are trying to program¹ to turn on lamps in a pattern on a grid for you. This lamplighter can only understand a few simple commands:

1. F: move forward one space
2. R: turn right 90°
3. L: turn left 90°
4. O: turn on the lamp

For example, the program “F F O” tells the lamplighter to move two steps forward and then turn on the lamp.

1. Write a program that lights the lamps in the pattern below. Assume that all lamps start by being off, X means that lamp should be lit and that the lamplighter always begins in the bottom left corner facing upwards.

X	X	X	X
X	X	X	X
X	X	X	X
X	X	X	X

How long is your program in terms of number of commands? If the grid was of size n -by- n , give a big- O estimate for how long your program would be to light the same pattern. Hint: first try writing a program for a 5-by-5 grid then a 6-by-6 grid and see if you can find a pattern.

2. Write a program that lights the lamps in the pattern below. Assume that all lamps start by being off, X means that lamp should be lit and that the lamplighter always begins in the bottom left corner facing upwards.

¹By a program, we mean a sequence of commands written on paper. This is an example of a paper coding exercise. You will **not** be using Python or any other programming language to do this activity.

X	X	X	X
X			X
X			X
X	X	X	X

How long is your program in terms of number of commands? If the grid was of size n -by- n , give a big- O estimate for how long your program would be to light the same pattern. Hint: first try writing a program for a 5-by-5 grid then a 6-by-6 grid and see if you can find a pattern.

This project will be scored out of 100 points in the following way:

1. Each program for the 4-by-4 grid will be worth 20 points.
2. Each big- O estimate for the n -by- n grid will be worth 20 points.
3. The neatness and completeness of your write-up will be worth 20 points. (This includes using full sentences, proper formatting and grammar, etc.)