National University of Singapore
School of Computing
CS1010S: Programming Methodology
Semester I, 2024/2025

Tutorial 4
Abstraction, Decomposition & Integration

Release date: 9th September 2024
Due: 15th September 2024, 23:59

General Restrictions

- No importing additional packages unless explicitly allowed to do so.
- Do not use any compound data structures, such as `tuple`, `list`, `dict`, `set`, etc.

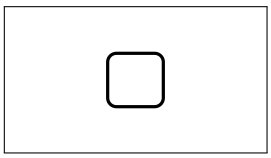
Questions

1. Implement a function `symmetric_grid` that takes a positive integer n ($n > 0$) and prints the following pattern:

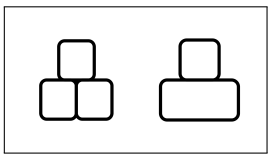
```
>>> symmetric_grid(3)
*__
_*_
__*

>>> symmetric_grid(6)
*_____
_*____
__*___
___*__
____*_
_____*
```

2. You have been asked to babysit your 5-year-old nephew for the weekend, and he likes to play with blocks. The blocks come in two forms: (i) cubes; and (ii) 2-cube cuboids (equivalent to 2 cubes glued together). He wants to build pyramids, which have n layers. The bottom layer has length n, and each subsequent layer above is 1 cube shorter. At the very top is a cube.

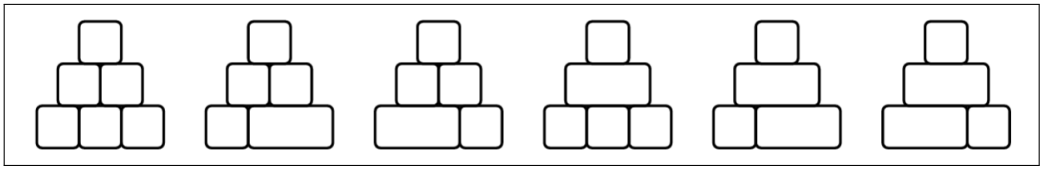
   For $n = 1$, there is only one way to build the pyramids

   For $n = 2$, there are two possible ways, using either two cubes or one cuboid at the base.

   For $n = 3$, there are six possible ways.

   Implement a **recursive** function `pyramids(n)` that takes in `n`, the number of layers, and returns the number of possible pyramids.