



1. Grid.

Write a program `gridxo.py` that reads an integer command line argument n and draws an $n \times n$ grid with the character `x`, except for the diagonal, which will contain the character `o`. For example,

```
> python gridxo.py 4
o x x x
x o x x
x x o x
x x x o
```

produces a 4×4 table where all diagonal entries contain `o`. A entry is on the diagonal if its row index and column index are equal.

2. Zigzag.

- Write a function `zigzag(n, d, theta)` that draws a zigzag line of n segments. Drawing each segment of the zigzag consists of: (1) rotating a turtle counterclockwise by an angle θ and moving forward by a distance d ; (2) rotating the turtle clockwise by 2θ and moving a distance of $2d$; (3) rotating counterclockwise by 2θ and moving a distance of d ; and finally (4) rotating clockwise by θ . For example the call `zigzag(2, 50, 15)` produces the zigzag line on the left below.
- Write a function `zigsquare(n, d, theta)` that draws a "zigzag-square" where each side is a zigzag line, as defined above.
- Write a program that reads three integers from the command line representing the values n , d , and θ and calls `zigsquare()` to draw a square. For example,
> python zigzag.py 2 50 15
produces the zigzag square on the right below.



3. VCV.

A character in a string is said to be "vcv" if it is a consonant (i.e., non-vowel) and has both a vowel preceding it and a vowel following it in the string. Vowels are the characters 'a', 'e', 'i', 'o', 'u'. Write a program `vcv.py` that reads a string from the command line and finds and prints the vcv characters. Neither the first nor the last characters of a string can be vcv. You may assume that all strings to be handled consist of lower case characters only.

Your program must include:

- a function `is_vowel(c)` that returns a boolean indicating whether a character is a vowel or not
- a function `vcv(st)` that takes in a string, and constructs and returns a string containing only the consonants that are surrounded by vowels.

Your program should call these functions as needed, and print the number of vcv characters followed by those characters. For example, the string 'kaleidoscope' has 3 vcv characters because l, d, and p are surrounded by vowels.

```
> python vcv.py kaleidoscope
3 vcv characters: ldp
```

Submission. Zip the three `.py` files above (`gridxo.py`, `zigzag.py`, and `vcv.py`) in a single archive file `exam1_netid` where `netid` is your AUBnet user name, and submit to Moodle.