Assignment #4

Exercise#1

Who is Farther?

Problem Description
Nikky and Byron are playing a silly game in gym class.

Nikky is told by his teacher to walk forward a steps ($1 \leq a \leq 100$) and then walk backward b steps ($1 \leq b \leq 100$), after which he repeats a forward, b backward, etc. Likewise, Byron is told to walk forward c steps ($1 \leq c \leq 100$) and then walk backward d steps ($1 \leq d \leq 100$), after which he repeats c forward, d backward, etc. You may assume that $a \geq b$ and $c \geq d$.

Byron and Nikky have the same length of step, and they are required to take their steps simultaneously (that is, Nikky and Byron will both step forward on their first steps at the same time, and this will continue for each step).

Nikky and Byron start walking from one end of a soccer field. After s steps ($1 \leq s \leq 10000$), the gym teacher will blow the whistle. Your task is to figure out who has moved the farthest away from the starting position when the whistle is blown.

Input Specification
The input will be the 5 integers a, b, c, d, and s, each on a separate line.

Output Specification
The output of your program will be one of three possibilities: `Nikky` if Nikky is farther ahead after s steps are taken; `Byron` if Byron is farther ahead after s steps are taken; `Tied` if Byron and Nikky are at the same distance from their starting position after s steps are taken.

Sample Input
```
4
2
5
3
12
```

Output for Sample Input
```
Byron
```

Explanation of Output for Sample Input
Notice that after 12 steps, Nikky has moved $4 - 2 + 4 - 2$ steps, for a total of 4 steps from the starting position, whereas Byron has moved $5 - 3 + 4$ steps, for a total of 6 steps from the starting position. Thus, Byron is ahead.

Exercise#2

Boolean Operators

Review your Boolean logic operators and then predict weather each statement below is either **True** or **False**
After you have made all your predictions, put them into trinket with the `print` command in front of each expression and see if you were correct or not….”not” get it☺.

1. `True and True`
2. `False and True`
3. `1 == 1 and 2 == 1`
4. `"test" == "test"`
5. `1 == 1 or 2 != 1`
6. `True and 1 == 1`
7. `False and 0 != 0`
8. `True or 1 == 1`
9. `"test" == "testing"`
10. `1 != 0 and 2 == 1`
11. `"test" != "testing"`
12. `"test" == 1`
13. `not (True and False)`
14. `not (1 == 1 and 0 != 1)`
15. `not (10 == 1 or 1000 == 1000)`
16. `not (1 != 10 or 3 == 4)`
17. `not ("testing" == "testing" and "Zed" == "Cool Guy")`
18. `1 == 1 and not ("testing" == 1 or 1 == 0)`
19. `"chunky" == "bacon" and not (3 == 4 or 3 == 3)`
20. `3 == 3 and not ("testing" == "testing" or "Python" == "Fun")`

Exercise#3

You are asked to program an automatic wildlife camera to switch on if the light level is less than 0.01 *lumens* or if the temperature is above freezing, but *not if both conditions are true*.

Your first attempt to write the conditions in your program are as follows:

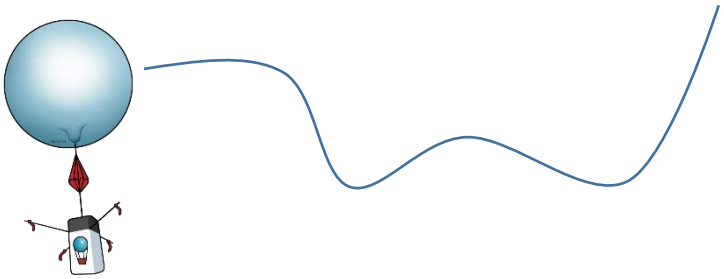
```
if (light < 0.01) or (temperature > 0.0):
```

A friend says you are foolish because if both of these conditions are true the cameral will turn on…and that’s *not* what you want.

Create a program that will ask the user for light conditions and temperature and will return either ON or OFF based on the required conditions above.

Exercise#4

Tracking a Weather Balloon Height



Problem Description

Margaret has looked at the wind floating over the prairies for a long time. After these observations, she has created a formula that will describe the altitude of a weather balloon launched from her house. In particular, her equation predicts the altitude A (in metres above the ground) at hour t after launching her balloon is:

$$A = -6t^4 + ht^3 + 2t^2 + t$$

where h is an integer value representing the humidity as a value between 0 and 100 inclusive.

Margaret is curious at what the earliest hour is (if any) that her weather balloon will hit the ground after launch, so long as it is no more than the maximum time, M, that Margaret is willing to wait. You can assume that the weather balloon touches ground when $A \leq 0$.

In order to do this, your program should use the formula to calculate the altitude when $t = 1$, $t = 2$, and so on, until the balloon touches the ground or $t = M$ is reached.

Input Specification

The input is two non-negative integers: h, the humidity factor, followed by M, the maximum number of hours Margaret will wait for the weather balloon to return to ground. You can assume $0 \leq h \leq 100$ and $0 < M < 240$.

Output Specification

The output will be one of the following possibilities:

- `The balloon does not touch ground in the given time.`
- `The balloon first touches ground at hour:`
  `T`

where T is a positive integer value representing the earliest hour when the balloon has altitude less than or equal to zero.

Sample Input 1

```
30
10
```

Output for Sample Input 1

```
The balloon first touches ground at hour:
6
```

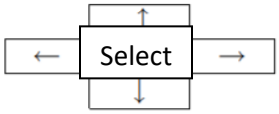
Sample Input 2

```
70
10
```

Exercise#4

TV Remote Annoyance

Some digital TV devices (like the amazon fire stick or Apple TV) come with a remote control. Most of these remote controls *don't* have a key pad and when you enter words to search for movie titles etc. you have to use the cursor buttons on the remote control and a character map to enter letters.



The screen displays a grid of the letters and symbols that can be used to "type out" the description. Here is the layout of the grid:

A	B	C	D	E	F
G	H	I	J	K	L
M	N	O	P	Q	R
S	T	U	V	W	X
Y	Z	space	-	.	enter

If the grid above comes up on the screen and you want to enter the word "H I T" assume your cursor starts on the first letter H and you can click the arrow buttons (left, right, up, down) to move the cursor to select the next letter…this would take 4 arrow clicks (not including letter selection).

Create a program in python that will tell you the minimum number of clicks (**not including selecting the letter**) it will take to enter in a particular word if your cursor starts on the first letter:

Examples:

Input#1: BAD
Output#1: 4 Clicks

Input#2: CAT
Output#2: 6 Clicks

Input#3: GIVE
Output#3: 9 Clicks

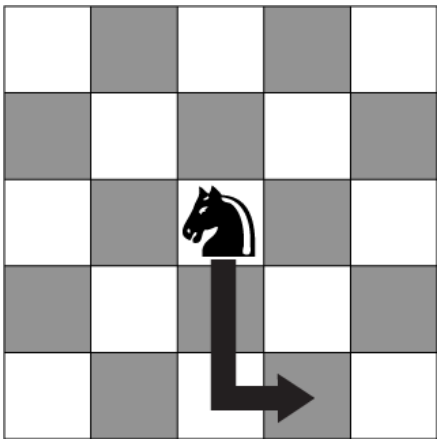
Hint: you should probably use a **2D lists** to solve this one.

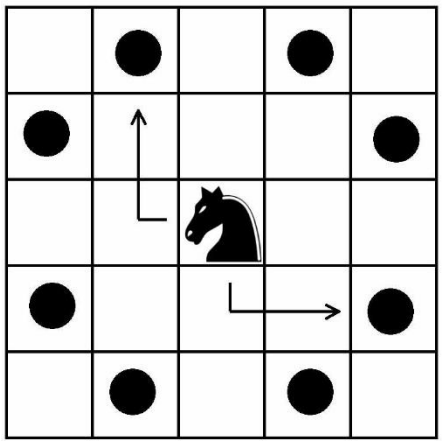
```
letters=[['A',1,1],['B',2,1],['C',3,1],...['U',3,4],..['Z',2,5]]
```

Bonus Problem

Chess – Knight Moves

In the game of chess the "*horsy-guy*" (The Knight) can move in an L-shape as shown below…If you are unfamiliar how this chess piece moves you can google a youtube video for a good description





Assuming a **small 8 x 8 limited chess grid**, Create a program that does the following:

Your program will read the starting location of the knight and output the smallest number of jumps or moves needed to arrive at a location specified in the second input.

Input Specification
Your program will read four integers, where each integer is in the range 1…8. The first two integers represent the starting position of the knight. The second two integers represent the final position of the knight.

Output Specification
Your program should output the minimum (non-negative integer) number of moves required to move the knight from the starting position to the final position. Note that the knight is not allowed to move off the board during the sequence of moves.

Sample Input 1
```
2 1
3 3
```

Output for Sample Input 1
```
1
```

Sample Input 2
```
4 2
7 5
```

Output for Sample Input 2
```
2
```