

CS177 Fall13 - Lab for week: 4

Lab Title: Using functions, multi-way conditionals and booleans

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Outcomes

In this lab you will learn:

- The concepts of function definition, function call and return statements
- How to use Boolean operators and how to write Boolean expressions
- Multi-way conditionals statements
- Importing and using functions from **random** library in python

Prerequisites

Textbook references:

Chapters 4 and 5

Lesson and recitation slides:

Week 2&3 lesson slides: <http://courses.cs.purdue.edu/cs17700:fall13:syllabus>

Week3 recitation slides: <http://courses.cs.purdue.edu/cs17700:fall13:syllabus>

Prelab material:

Prelab4 material <http://courses.cs.purdue.edu/cs17700:fall13:prelabs:prelab4>

Set-up

Create the folder lab04 under the cs177 folder.

Download the lab4.py skeleton code.

Introduction

In this lab, you will be implementing a **sea condition forecaster** used by savvy surfers to decide whether they can go surfing or not. The sea condition forecaster function uses the data about wind conditions and wave conditions to forecast the sea conditions. The program will inform the surfers if the conditions are ideal for surfing and it will also warn the surfers of any hazardous conditions or if any caution needs to be taken.

The data about the wind and wave conditions in the program are generated using the **randint()** function from the **random** library available in Python. We are randomizing the process of forecasting the wind and wave conditions. Based on these randomly generated conditions, our algorithm will give a forecast on the sea conditions.

To make the right forecast, we will be using multi-way decision statements (if, elif, else statements). The conditions which we use to make decisions will be in the form of Boolean expressions. Depending on which of the Boolean expression is **True**, a corresponding set of statements will be executed to get the right forecast.

The code you will be writing will contain four functions:

- The `wind_forecaster` function which returns an average wind speed index value and a wind gust index value. These values are generated randomly.
- The `wave_condition` function which returns the wave condition index which is also generated randomly.
- The `sea_condition_forecaster` function which calculates the seas' condition based on the values returned by the above two functions and returns the forecast which is encoded as an integer.
- The `main` function which decodes the value returned by the `sea_condition_forecaster` and outputs a message in the form of a string which the surfers can read.

NOTES:

- To facilitate your work, we provided you the file **lab4.py** that you have downloaded in the lab04 folder. This file contains some statements already provided to you and marked with the comment (remember that a line starting with the # sign is a comment!) **# DO NOT MODIFY OR DELETE THIS STATEMENT**
- Also statements following the comment: **# DO NOT MODIFY THIS STATEMENT** must not be modified.
- You have to write your Python statements in this file AFTER the **# WRITE YOUR CODE HERE** comment.
- Use proper indentation

Exercises

Exercise 1

This exercise will focus on defining functions and returning values from the function. It will also focus on generating and assigning random integer values to variables.

TO DO 1.1

Define a function named `'wind_forecaster'`. The function doesn't take any input arguments. The function should do the following:

- Assign a random integer value in the range (-1, 2) to the variable named `'average_wind'`
- Assign a random integer value in the range (-1, 2) to the variable named `'wind_gust'`
- Return the values of both `'average_wind'` and `'wind_gust'`

#NOTE- Be careful in using the proper indentation when writing the function!

TO DO 1.2

Define a function named `'wave_condition'`. The function doesn't take any input arguments. The function should do the following:

- Assign a random integer value in the range (-1, 2) to the variable named `'wave_cond'`
- Return the value of `'wave_cond'`

#NOTE- Be careful in using the proper indentation when writing the function!

Exercise 2

This exercise will also focus on defining functions, making function calls, and using the returned values from functions. You will also be writing multi-way decision statements.

TO DO 2.1

Define a function named 'sea_condition_forecaster'. Again, the function does not take any input arguments. The function should do the following:

- Make a call to the function 'wind_forecaster' and assign the returned values to the variables named 'av_wind' and 'wind_gust'
- Print the values of 'av_wind' and 'wind_gust' as "Average wind index= " and "Wind gust index= ".
- Make a call to the function 'wave_condition' and assign the returned value to the variable 'wave_cond'
- Print the value of 'wave_cond' as "Wave condition index= ". The value should be plugged in after the '=' operator.

#NOTE- Be careful in using the proper indentation when writing the function!

TO DO 2.2

You need to check the values of the variables 'av_wind', 'wind_gust' and 'wave_cond'. Use multi-way decision statements for this purpose.

- Check if the values of 'av_wind', 'wind_gust' and 'wave_cond' are equal to zero. **If either of these values are zero**, then the function should **return** the integer **-20** (it implies that the conditions are hazardous)
- In the second decision statement, check if the values of 'av_wind', 'wind_gust' and 'wave_cond' are less than zero. **If either of these values are less than zero**, then the function should **return** the integer **-10** (it implies that the conditions are not ideal and caution is advised)
- In the third decision statement, check if the values of 'av_wind', 'wind_gust' and 'wave_cond' are greater than zero. **If all of these values are greater than zero**, then the function should **return** the integer **0** (it implies that the conditions are ideal for surfing)
- For **all other cases** (if there are any), the function should **return** an integer value of **100**

#NOTE- Be careful in using the proper indentation when writing the function!

HINT 1

Use these AND and OR truth tables for your reference:

<i>x</i>	<i>y</i>	<i>x or y</i>	<i>x</i>	<i>y</i>	<i>x and y</i>
T	T	T	T	T	T
T	F	T	T	F	F
F	T	T	F	T	F
F	F	F	F	F	F

HINT 2

Illustration of how to write a complex conditional, such as "If ALL the variables are equal to zero". Suppose we have three variables (a, b, c), and we need to test if ALL the given variables are equal to zero, how do you convert it into a Boolean statement to test this condition?

In Python, the above condition can be written as `'if a==0 and b==0 and c==0:'`

Now think of how you will write a complex conditional statement if the statement above is replaced by "If EITHER of these values is equal to zero", meaning that one of the values considered is equal to zero. Which Boolean operator will you use in this case?

Exercise 3

You will be writing the main() function. This exercise will again focus on writing decision statements and making function calls and using the return values.

TO DO 3.1

- Call the 'sea_condition_forecaster' function. Store the returned value in a variable named 'condition'
- Check if the value in 'condition' is **equal to -20**. If yes, then print the message "Hazardous conditions. Avoid surfing"
- Check if the value in 'condition' is **equal to -10**. If yes, then print the message "Surfing allowed, but be cautious"
- Check if the value in 'condition' is **equal to 0**. If yes, then print the message "Conditions suitable for surfing!"
- For **all other cases**, print the message "Forecast not available. Surf at your own risk."

#NOTE- Be careful in using the proper indentation when writing the function!

IMPORTANT-When you have finished writing your program in the file lab4.py, make sure to save it!

NOTE- There are no test cases for this lab as the code generates random values and then uses these values to get the desired output. Once you have completed writing your code, you should just save and run the code. Please seek the help of the lab TA's if you don't know how to run your code.

You should be able to verify yourself if the printed values are indeed what was expected. If you can understand and write the conditional statements then you will get the right result.

Some example results:

```
>>> main()
Average wind index= -1
Wind gust index= 2
Wave condition index= 1
Surfing allowed, but be cautious
```

```
>>> main()
Average wind index= 0
Wind gust index= 2
Wave condition index= 0
Hazardous conditions. Avoid surfing
```

```
>>> main()
Average wind index= 2
Wind gust index= 2
Wave condition index= 1
Conditions suitable for surfing!
```

Grading Rubric

TO DO 1.1	15
TO DO 1.2	10
TO DO 2.1	15
TO DO 2.2	30
TO DO 3.1	30
Total	100

Turn-in instructions

You must turn-in one files: lab4.py you created under the folder lab04.

From the UNIX terminal window, login into your UNIX CS account.

Then launch the following command:

```
$ cd
```

```
$ cd CS177
```

```
$ turnin -v -c cs177=COMMON -p lab04 lab04
```