

Lab 1: Control Structures I

This lab introduces the concepts and syntax of `if/elif/else` statements, as well as `for` and `while` loops.

Part I: Written Exercises

1. Consider the following code (draw a flowchart diagram if it helps):

```
if x>2:
    if y>2:
        z=x+y
    print "z is ",z
else:
    print "x is ",x
```

What is the output if:

- $x = 2$ and $y = 5$?
- $x = 3$ and $y = 1$?
- $x = 1$ and $y = 1$?
- $x = 4$ and $y = 3$?

2. Suppose we have the following code:

```
z = x+3
if z==1:
    y=0
elif z==2:
    y=10
elif z==4:
    y+=1
else:
    y=1
```

- What is y equal to at after the switch statement if $x = 3$ and $y = 5$ entering the switch?
- What if $x = 2$ and $y = 5$ at the beginning?

3. What does the following code output, and how many times do we run through the *loopbody*?

```
i=0
while i < 10:
    i+=1
    if i%2 == 0:
        print i
```

4. How about this version of the code?

```
i=0
while i > 10:
    i+=1
if i%2 == 0:
    print i
```

Part II: Computer Exercises:

Create a new python file called `UsingControlStructures.py`. We will be checking this python file, so be sure that everything works. There will be instructions below to mark the different questions on this part of the lab.

Copy the following code into your file:

```
theInput = raw_input("Enter an integer: ")
#Your code here
```

This code waits for the user to type an integer and press the “Enter” key, then returns what they entered as an integer. In the code we store the value in a variable called `theInput`.

5. Now insert code into the code above so that the program prints “even” if the input integer is even and “odd” if it is odd.

For problem 6-9, use the same Python file as the previous problems. Separate the output for each of the following problem problems by printing “-----” to the screen.

6. Declare and initialize variables representing:
 - a. The age people start primary school, example: `primarySchoolAge = 4;`
 - b. The legal voting age.
 - c. The age you can become president.
 - d. The official retirement age.
 - e. A person’s age. Do this by using:

```
personsAge = input("Enter an age: ")
```

Again, this just waits for the user to enter a number and then stores it in some variable.

In the current file, use `if-elif` statements to print:

- f. “Too young.” if the person is too young for school.
- g. “Remember to vote” if the person is old enough to vote.
- h. “Vote for me” if the person is old enough to be president and “You can’t be president” if they are not.
- i. “Too old.” if the person is old enough to retire.

7. Write a `for` or `while` loop that prints out all the multiples of 3 down from 40 to 0 in decreasing order. That is, 39, 36, 33, ..., 3, 0.
8. Write a loop that prints out all numbers between 6 and 30 that are **not** divisible by 2, 3, or 5.
9. Using a `while` loop, find the smallest positive integer n such that $79*n$ has a remainder of 1 when divided by 97.

Part III: Extra Credit

If you do not finish these in the allotted lab time, that is okay; you can go back at any point later in the course and submit these problems. Please make a new Python file for problems 1, 2, and 3 named `Lab03a_1.py`, `Lab03_2.py`, `Lab03_3.py`.

Don't hesitate to ask for clarifications or help!

1. Suppose we want to send some numbers over a phone line, but the phone line is tapped. We want to use some (very simple) encryption to stop them from stealing our information.

One quick and easy way to do this is to reverse the digits of our number. For example, 12345 becomes 54321. Think about how we can use `%10` in a loop to get the last digit, and how we can make the new number using a loop. Use only basic control structures and operators (don't use String methods).

Code a small program that will take in a number and print out the encrypted number.

2. To make our encryption even better, we can take each digit d of our number, and replace it with $((d + 7) \bmod 10)$ before we make our new number. (Note that `mod` is the same as `%`).

For example, if we encrypt 12345:

```
12345 ==> 89012 (from the digit change) ==> 21098 (from reversing it)
1532972 ==> 8209649 ==> 9469028
```

Add this code to problem 1 so that both versions of the encryption are displayed. If you have any questions regarding what the problem is asking, don't hesitate to ask.