Beihang University
International School

Beijing, Oct. 9th, 2018
Qingnan Rong

Lab Class 2

1. Topic: Sequential Execution

Task 1. ***Input – Assignment – Output*** *(5 minutes)*

Implement the following in Python: Assign variable a with the value obtained from user input and assign variable b with a's value. Finally, print the value of b.

Hint: *Make use of the built-in functions input() and print().*

Task 2. ***Python as a Calculator*** *(5 minutes)*

Write a Python program which calculates the value of following expression (here $[a] = int(a)$)

$$\left[\frac{8000.01 + 19}{37}\right] * 15^2 - 3861$$

2. Topic: Boolean & If/else

Task 3. ***Boolean Expression*** *(10 minutes)*

Type the following code in your Spyder IDE and evaluate the output of the following expressions:

```
print (5<6)
print (5<=6)
print (5==6)
print (5>=4)
print (5==6 or 6==6)
print (5==6 and 6==6)
print (not(5==6) and 6==6)
```

Task 4. ***If/else*** *(5 minutes)*

Implement the following in Python: Assign variable a with the value 5 and assign variable b with the value obtained from user input. If a is smaller than b, we want to increase a by 2. Otherwise, we want to decrease a by one. Finally, print the value of a.

Hint: Use function input().

Task 5. ***If/elif/else*** *(10 minutes)*

Calculate your Grade Point (GP) of a certain course with the following rules. For your grade of a certain course,

(1) If the grade is smaller than 60, GP = 0;
(2) If the grade is within [60,69], GP = 1;
(3) If the grade is within [70,79], GP = 2;
(4) If the grade is within [80,84], GP = 3;
(5) If the grade is within [85,100], GP = 4.

Task 6. ***If/else*** *(10 minutes)*

Please implement a simple login system in Python. When user types in the correct user name and password (e.g. 'User' and '123456') print 'logged in', otherwise print 'sorry'.

Task 7. ***If/else*** *(10 minutes)*

Implement a Python program which assigns four numbers to variables a, b, c, d (for instance, a=3, b=8, c=7, d=6). Identify and print the largest number among them. Note that your code should work for all possible variable assignments, not only the given example.

3. Topic: Mathematics

Task 8. ***Quadratic equation*** *(10 minutes)*

Here is a quadratic equation with x unknown.

$$ax^2 + bx + c = 0$$

Please write a Python program that receives the value of a,b,c and if any root exists, print all roots of the equation. Otherwise, the program should print 'No real roots'.

Hint:

$$x = \begin{cases} \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}, \text{ if } a \neq 0 \text{ and } b^2 - 4ac \geq 0 \\ -\dfrac{c}{b}, \text{ if } a = 0 \\ \text{No real roots, otherwise} \end{cases}$$

Write 'import math' at the beginning of the code. Then use a=math.sqrt(b) to compute the square root of b.

Task 9. ***Int and float*** *(15 minutes)*

(1) See the output of the following expressions: (5 minutes)

```
a=7
b=8

print(int(a/2))
print(a/2)
print(int(b/10)*10==b)
```

(2) For a given number, please print it with 3 decimal places and 2 integer places. For instance, for x=12.3, you need to output 'Your number is 12.300'. (5 minutes)

(3) Input a number b from the user. If b is a multiple of 7, print 'yes'. Otherwise, print 'no'. (5 minutes)

4. Topic: Slightly complex problems (start only if you finished the previous tasks!)

Task 10. ***Sort sequence*** *(15 minutes)*

Suppose that you are given 3 numbers $a1$,$a2$,and $a3$. please sort them with increasing order. For instance, if your input is $a1 = 3$, $a2 = 7$, $a3 = 4$., you need to ouput the following result: 3,4,7. (Note: Please read the three number with input().)

If you finish this task, please think about how to solve this problem with more numbers (4,5,...).

Task 11. ***Built-in functions in Python: math*** *(15 minutes)*

Input three points that are described with six variables x1,x2,x3,y1,y2,y3 (see Figure 1). Given the six variables, for instance, generated by user input, please compute the angle between two shorter sides of the generated triangle. Please note that the shorter sides of the triangle depend on the user input; they have to be determined by your program!

Hint: You can start with constants for the variables in order to implement/test your program.
Hint: Write 'import math' at the first line of the code in order to import a mathematics library.
Hint: Go to `https://docs.python.org/3/library/math.html` *to identify functions from the math library relevant to this assignment. As an example, the square root of a number* b *can be computed with* $sr = math.sqrt(b)$.

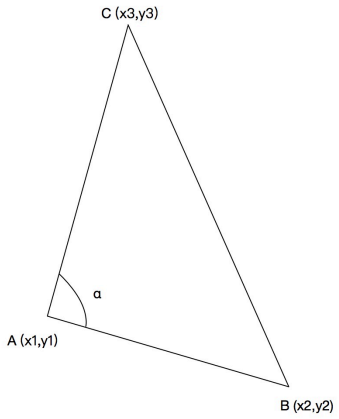

Figure 1: Triangle for Task 11