

Lab Questions: Lab Session 5

Deadline: 20.09.2017 11:59pm SGT

Complete all assignments below. For those questions that are marked with an asterisk *, i.e. questions 7 and 9, create the script files as requested. Once you are done with it, submit the file via iNTU. Remember to put plenty of comments for all assignments, as this helps us to better understand your program (which might give you higher marks).

Important!!! Make sure your scripts work properly, as we give 0 marks otherwise. Please name the scripts according to the requirements, and upload each file separately and not in a Zip file or similar. The submission system closes at the deadline. Hence after that, you will get no marks for your solution.

1. What would be the result of the following expressions?

(a) `3 == 2 + 1`

Solution:

True

(b) `(3 == 2) + 1`

Solution:

1

(c) `5 < 6 or 8 > 4`

Solution:

True

(d) `5 < 10 > 4`

Solution:

True

(e) `False and True and True or False or True and False`

Solution:

False

2. Write a script that tests whether the user can follow instructions. It prompts the user to enter an 'x'. If the user enters anything other than an 'x', it prints an error message - otherwise, the script does nothing.

Solution:

follow.py

```
# Can the user follow instructions??
inx = input('Enter an x: ')
if inx != 'x': print("That was no 'x' !")
```

3. Write a script to calculate the volume of a pyramid (square base), which is $\frac{1}{3} * \text{base} * \text{height}$, where the base is $\text{length} * \text{width}$. Prompt the user to enter values for the length, width, and height, and then calculate the volume of the pyramid. When the user enters each value, he or she will then also be prompted for either 'i' for inches or 'c' for centimeters. (Note $2.54 \text{ cm} = 1 \text{ inch}$). The script should print the volume in cubic inches with three decimal places. As an example, the output format will be:

This program will calculate the volume of a pyramid.

Enter the length of the base: 50

Is that i or c? i

Enter the width of the base: 6.3

Is that i or c? c

Enter the height: 4

Is that i or c? i

The volume of the pyramid is 165.354 cubic inches.

Solution:

pyramid.py

```
# Calculate the volume of a pyramid. Prompt the user for
# the length, width, and height in either inches or
# centimeters (inches is assumed and will be the default)
print('This script calculates the volume of a pyramid.')

# input and potential conversion of the length
length = float(input('Enter the length of the base: '))
if input('Is that i or c? ') == 'c':    length = length/2.54

# input and potential conversion of the width
width = float(input('Enter the width of the base: '))
if input('Is that i or c? ') == 'c':    width = width/2.54

# input and potential conversion of the height
height = float(input('Enter the height: '))
if input('Is that i or c? ') == 'c':    height = height/2.54

# computation and printing of the volume
vol = 1/3 * length * width * height
print('\nThe volume of the pyramid is %.3f cubic inches.' % (vol))
```

4. Write a script to prompt the user for a character, and then print whether that it is a letter of the alphabet or that it is not (hint: check string methods). You must also check that the user indeed inserted a single character, and not several ones.

Solution:

alphabet.py

```
# Asks the user to type a character and checks if this
# character is a letter from the alphabet or not

# input the character from the user
my_char = input('Enter a character: ')
if len(my_char)!=1:
    print('This is not a character !')
elif not my_char.isalpha():
    print('This is not a letter from the alphabet')
else:
    print('This is a letter from the alphabet')
```

5. The eccentricity of an ellipse *Eccen* is defined as

$$Eccen = \sqrt{1 - \left(\frac{b}{a}\right)^2}$$

where a is the semimajor axis and b is the semiminor axis of the ellipse. A script prompts the user for the values of a and b . Since division by 0 is not possible, the script prints an error message if the value of a is 0 (it ignores any other errors, however). If a is not 0, the script calculates the eccentricity, and then prints the result. Write the script.

Solution:

Eccen.py

```
# Prompts the user for the semimajor and semiminor axes of
# an ellipse, calculates and prints the eccentricity
# (if the semimajor axis ~=0)
import math

a = float(input('Enter the semimajor axis: '))
b = float(input('Enter the semiminor axis: '))

if a == 0: # if the user entered a zero semimajor
    print('Error: semimajor cannot be 0')
else: # if the user entered a non-null semimajor
    eccentricity = math.sqrt(1-(b/a) ** 2)
    print('The eccentricity is %.2f' % (eccentricity))
```

6. In chemistry, the pH of an aqueous solution is a measure of its acidity. The pH scale ranges from 0 to 14, inclusive. A solution with a pH of 7 is said to be *neutral*, a solution with a pH greater than 7 is *basic*, and a solution with a pH less than 7 is *acidic*. Write a script that will prompt the user for the pH of a solution, and will print whether it is neutral, basic, or acidic. If the user enters an invalid pH, an error message will be printed.

Write two version of the script: one using only nested **if-else** statements (pHIfElse.py) and one using a single **if-else** statement with **elif** clauses (pHElif.py).

Solution:

pHIfElse.py

```
# Prompts the user for the pH of a solution and prints
# whether it is basic, acidic, or neutral
ph = float(input('Enter the pH of the solution: '))
if ph < 0 or ph > 14:
    print('Error in pH!')
else:
    if ph < 7:
        print('It is acidic')
    else:
        if ph > 7:
            print('It is basic')
        else: # no need to write another nested if block to check if ph==7
            print('It is neutral')
```

pHElif.py

```
# Prompts the user for the pH of a solution and prints
# whether it is basic, acidic, or neutral
ph = float(input('Enter the pH of the solution: '))
if ph < 0 or ph > 14:    print('Error in pH!')
elif ph < 7:    print('It is acidic')
elif ph > 7:    print('It is basic')
else:    print('It is neutral') # no need to write "elif ph==7"
```

7. * Write a script <YourMatricNo>_Lab5_travel.py that will first prompt the user for a distance in kilometers (with error check that the input distance can't be negative). Then, the script will print the cost of the travel by walking, by motorcycle, by car and by plane, knowing that:

- walking, motor-cycle, car and plane travel cost 0, 0.22, 0.26 and 0.78 SGD per kilometer respectively;
- walking can't be done for more than 20 kilometers, motor-cycle travel can't be done for more than 200 kilometers, car travel can't be done for more than 800 kilometers, plane travel can't be done for less than 100 kilometers.

For example, the output will look like this:

```
Enter the distance in kilometer: 12
The cost by walking is free !
The cost by motorcycle is 2.6 SGD
The cost by car is 3.1 SGD
You travel is too short to be done by plane
```

Solution:

travel.py

```
# Prompts a distance to the user in kilometers (with error check)
# Prints the travel cost by walking, car, motor-cycle, plane
# depending on the distance

distance = float(input('Enter the distance in kilometer: '))

# error check on the distance
if distance < 0:
    print('Error, your distance is lower than 0 !')
```

```

# if no error when inputing the distance
else:
    # travel by walking
    if distance <= 20:
        print('The cost by walking is free !')
    else:
        print('Your travel is too long to be done by walking')

    # travel by motor-cycle
    if distance <= 200:
        cost = distance*0.22;
        print('The cost by motorcycle is %.1f SGD' % (cost))
    else:
        print('Your travel is too long to be done by motorcycle')

    # travel by car
    if distance <= 800:
        cost = distance*0.26
        print('The cost by car is %.1f SGD' % (cost))
    else:
        print('Your travel is too long to be done by car')

    # travel by plane
    if distance >= 100:
        cost = distance*0.78
        print('The cost by plane is %.1f SGD' % (cost))
    else:
        print('Your travel is too short to be done by plane')

```

8. Write a script `currency.py` that will prompt the user for an amount in Singapore Dollars, and then to which foreign currency he would like to convert this amount ('E' for Euros, 'U' for US Dollars, 'J' for Japanese Yen). The script will then print the original amount with the trailing zeros removed (hint: find the formatting operator that removes the trailing zeros) and the converted amount restricted to one decimal. The output should look like this:

Enter the amount in Singapore Dollars: 29.340

Do you want to convert this amount in Euros (E), US Dollars (U) or Japanese Yen (J)? U
 29.34 Singapore Dollars equals 21.6 US Dollars

The program must check that the user didn't enter a negative amount. You can check online for the latest currency rates.

Solution:

currency.py

```

# Prompts an amount in Singapore Dollars to the user (with error check)
# Prompts for conversion in Euros/US Dollars/Japanese Yens (with error check)
# Prints the result after conversion

amount = float(input('Enter the amount in Singapore Dollars: '))

# error check
if amount < 0:
    print('Error, the amount is negative')

# if no error when inputing the amount

```

```

else:
    choice = input('Do you want to convert this amount in Euros (E), US Dollars (U)
                  or Japanese Yens (J)? ')

    # conversion in Euros
    if choice == 'E':
        converted_amount = amount*0.6716
        print('%g Singapore Dollars equals %.1f Euros' % (amount, converted_amount))

    # conversion in US Dollars
    elif choice == 'U':
        converted_amount = amount*0.7363
        print('%g Singapore Dollars equals %.1f US Dollars' % (amount,
            converted_amount))

    # conversion in Japanese Yens
    elif choice == 'J':
        converted_amount = amount*78.1395
        print('%g Singapore Dollars equals %.1f Japanese Yens' % (amount,
            converted_amount))

    # error check
    else:
        print("Error, you didn't entered 'E', 'U' or J")

```

9. * Let A , B and C be three functions defined as:

$$A(x) = \begin{cases} x+2 & \text{when } x \leq 0 \\ x/\sqrt{x} & \text{when } x > 0 \end{cases}$$

$$B(x) = 2x^6 + 3x - 2$$

$$C(x) = \begin{cases} 6 & \text{when } x < -6 \\ -x & \text{when } x \geq -6 \text{ and } x < 3 \\ 0 & \text{when } x \geq 3 \end{cases}$$

Write a script `<YourMatricNo>_Lab5_three_func.py` that first asks the user which one of the three functions he would like to compute (with an error check), then asks for an x value and finally returns the value of the function chosen on point x .

Solution:

func.py

```

# Prompts the user (with error check) which function to evaluate
# either A, B, or C. Then, prompts the user for the value x and
# returns the result of the chosen function on the point x
import math

choice = input('Which function (A, B or C) ? ')

if choice == 'A':
    x = float(input('What is your x value ? '))
    if x > 0:
        output = x/math.sqrt(x)

```

```

    else:
        output = x + 2
        print('A(x)=%f' % (output))

elif choice == 'B':
    x = float(input('What is your x value ? '))
    output = 2*x**6 + 3*x - 2
    print('B(x)=%f' % (output))

elif choice == 'C':
    x = float(input('What is your x value ? '))
    if x < -6:
        output = 6
    elif x < 3:
        output = -x
    else:
        output = 0
    print('C(x)=%f' % (output))

else:
    print('Error, choose between A, B or C !')

```

10. Write a script `areaMenu.py` that will print a list consisting of “cylinder”, “circle”, and “rectangle”. It prompts the user to choose one, and then prompts the user for the appropriate quantities (e.g., the radius of the circle) and then prints its area. If the user enters an invalid choice, the script simply prints an error message. The script should use a nested `if-else` statement to accomplish this. Here are two examples of running it (units are assumed to be inches).

```

>>> areaMenu
Menu
1. Cylinder
2. Circle
3. Rectangle

```

Please choose one: 2

Enter the radius of the circle: 4.1

The area is 52.81

```

>>> areaMenu
Menu
1. Cylinder
2. Circle
3. Rectangle

```

Please choose one: 3

Enter the length: 4

Enter the width: 6

The area is 24.00

Solution:

areaMenu.py

```
# Prints a menu to choose between cylinder, circle and rectangle
# (with error check) and then calculates area of user's choice
# after having prompted for the relevant values
import math

print('Menu')
print('1. Cylinder')
print('2. Circle')
print('3. Rectangle')
sh = input('Please choose one: ')

if sh == '1':
    rad = float(input('Enter the radius of the cylinder: '))
    ht = float(input('Enter the height of the cylinder: '))
    print('The surface area is %.2f' % (2*math.pi*rad*ht))

elif sh == '2':
    rad = float(input('Enter the radius of the circle: '))
    print('The area is %.2f' % (math.pi*rad*rad))

elif sh == '3':
    len = float(input('Enter the length: '))
    wid = float(input('Enter the width: '))
    print('The area is %.2f' % (len*wid))

else:
    print('Error! Not a valid choice.')
```