

THE UNIVERSITY OF THE WEST INDIES
Department of Computing
COMP1126–Introduction to Computing I

Lab 4

Exercise

Type these expressions in the python shell.

```
>>>alist=[1,2,3]
>>>blist=range(1,4)
>>>alist
>>>blist
>>>clist=[4,5,6,7,8]
>>>len(clist)
>>>dlist=[]
>>>len(dlist)
>>>(lambda x : x) (54)
>>>(lambda x, y : x + y) (5, 4)
>>>(lambda f,x : f(x)) (lambda a: a**2, 4)
```

Problem 1

Write a function `sumlist` that takes a list and a function as input, applies the function to each element of the list, and returns the sum. Use a `for` loop for traversing through the elements in the list and accumulate the sum.

[Hint: Remember how `for` loops worked with `range`.

```
for i in range(15,18):
```

First time we enter the loop `i` will be 15, then 16 and finally 17.

Note instead of `range` we can actually use the list that is being entered as an argument.

```
for i in ls:
```

If `ls = [15,16,17]`, first time we enter the loop `i` will be 15, then 16 and finally 17.]

For example, assuming that `square` and `cube` have been defined already, you would observe the following:

```
>>>sumlist([1,2,3],square)
14
>>>sumlist([1,2,3],cube)
36
>>>sumlist([1,2,3],lambda x : x)
6
```

Problem 2

Write a function `mean` that takes a list and returns its mean value which is the sum of the values in the list divided by the length of the list. Function `mean` should use higher order procedure `sumlist` to calculate the sum and the function `len` to calculate the length of the list. If the list is empty return 0.

```
>>>mean([30,20,50,20])
30
```

Problem 3

Write a function `std_dev` that takes a list of numbers and returns its standard deviation. Variance is calculated by using the following formula:

$$variance = \frac{\sum x_i^2}{N} - \left(\frac{\sum x_i}{N} \right)^2$$

and standard deviation is square root of variance

$$stddev = \sqrt{variance}$$

For example,

`variance([10,20,30,40]) = ([102+202+302+402]/4) -(mean([10,20,30,40]))2`

`std_dev([10,20,30,40]) = math.sqrt(125)`