Session 6. Loop Logic I

1. Syntax of `for` loops

```
[1]: for i in [5,4,3,2,1]:
         print('Count down:',i)
     print('Take off!')
```

```
Count down: 5
Count down: 4
Count down: 3
Count down: 2
Count down: 1
Take off!
```

```
[2]: for name in ['Alice','Bob','Charles']:
         print(f'Hi {name}!')
```

```
Hi Alice!
Hi Bob!
Hi Charles!
```

Q1. Practicing `for` loops

a) Write a for loop to print the multiplication table for multiplying by 2, as in the sample output below.

```
[3]:
```

```
1 x 2 = 2
2 x 2 = 4
3 x 2 = 6
4 x 2 = 8
5 x 2 = 10
6 x 2 = 12
7 x 2 = 14
8 x 2 = 16
9 x 2 = 18
```

b) Write a for loop which takes in a list of names, such as `l=['Alice','Bob','Charles']`, and print the number of characters in each name, as below. Hint: you can use the `len` function to find the length of a string, as below.

```
len('Alice')
```

```
[4]:
```

```
The name Alice has length 5.
The name Bob has length 3.
The name Charles has length 7.
```

Example 1: Automating emails

```
[5]: data=[]
     data.append(['Alice','MBA'])
     data.append(['Bob','MBA'])
     data.append(['Charles','MSBA'])
     data
```

```
[['Alice', 'MBA'], ['Bob', 'MBA'], ['Charles', 'MSBA']]
```

```
[6]: for element in data:
         name,program=element
         email=f'''Dear {name},
     Congratulations! You have been accepted into the {program} Program at USC for Fall 2020.
     You will receive more details in a packet soon. Hope to see you soon!
     USC Admissions
         '''
         print(email)
```

```
Dear Alice,
Congratulations! You have been accepted into the MBA Program at USC for Fall 2020.
You will receive more details in a packet soon. Hope to see you soon!
USC Admissions

Dear Bob,
Congratulations! You have been accepted into the MBA Program at USC for Fall 2020.
You will receive more details in a packet soon. Hope to see you soon!
USC Admissions

Dear Charles,
Congratulations! You have been accepted into the MSBA Program at USC for Fall 2020.
You will receive more details in a packet soon. Hope to see you soon!
USC Admissions
```

1.2 Digression: Using `range` to specify what to iterate over

```
[7]: list(range(5,0,-1))
```

```
[5, 4, 3, 2, 1]
```

```
[8]: for i in range(5,0,-1):
         print('Count down:',i)
     print('Take off!')
```

```
Count down: 5
Count down: 4
Count down: 3
Count down: 2
Count down: 1
Take off!
```

```
[9]: list(range(0,5))
```

```
[0, 1, 2, 3, 4]
```

```
[10]: list(range(5))
```

```
[0, 1, 2, 3, 4]
```

```
[11]: for i in range(5):
          print('Repeating five times.')
```

```
Repeating five times.
Repeating five times.
Repeating five times.
Repeating five times.
Repeating five times.
```

Q2. Practicing `range` and `for` loops

a) Write one line of code using `range` which generates the list of odd numbers from 1 to 29.

```
[12]:
```

```
[1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29]
```

b) Write a function `squares` with one input parameter `n` (assumed to be a positive integer). The function should print the squares of the first `n` positive integers, as shown below.

```
[13]:
```

```
[14]: # Test code for Q2-a)
      squares(5)
```

```
1 x 1 = 1
2 x 2 = 4
3 x 3 = 9
4 x 4 = 16
5 x 5 = 25
```

c) Write a function `permutation` with one input parameter `n` (assumed to be a positive integer). The function should return the number of ways to order `n` distinct items, which is equal to $1 \times 2 \times \cdots \times n$.

```
[15]:
```

```
[16]: permutation(5)
```

```
120
```

2. Syntax of `while` loops

```
[17]: num=5
      while num>0:
          print('Count down:',num)
          num=num-1
      print('Take off!')
```

```
Count down: 5
Count down: 4
Count down: 3
Count down: 2
Count down: 1
Take off!
```

Example 2: Controlling when to stop via user input

```
[18]: keepGoing=True
      while keepGoing:
          name=input('Enter Name (enter STOP to end): ')
          if name=='STOP':
              keepGoing=False
          else:
              program=input('Enter Program: ')
              email=f'''Dear {name},
      Congratulations! You have been accepted into the {program} Program at USC for Fall 2020
      You will receive more details in a packet soon. Hope to see you soon!
      USC Admissions
              '''
              print(email)
```

```
Enter Name (enter STOP to end): Alice
Enter Program: MBA
Dear Alice,
Congratulations! You have been accepted into the MBA Program at USC for Fall 2020.
You will receive more details in a packet soon. Hope to see you soon!
USC Admissions

Enter Name (enter STOP to end): STOP
```

Q3. Practicing `while` loops

a) Write a while loop which continually asks for the name of an object and prints a message that says good night to the object. The program will only end if the user types nothing before pressing enter.

[19]:

```
Name an object you see: moon
Good night, moon!
Name an object you see: cow jumping over the moon
Good night, cow jumping over the moon!
Name an object you see: stars
Good night, stars!
Name an object you see: chair
Good night, chair!
Name an object you see:
```

b) Re-do Q2-b) and Q2-c) using `while` loops, instead of using `range` and `for` loops. You should name the functions `squares2` and `permutation2` respectively.

[20]:

[21]:
```
squares2(3)
```

```
1 x 1 = 1
2 x 2 = 4
3 x 3 = 9
```

[22]:
```
permutation2(5)
```

```
120
```