

## Question No.1 Algorithms A2.1 to A2.3

### A2.1 Insertion

```
import timeit
def insertion(li, data, pos):
    sub_li = li[:pos]
    post_li = li[pos:]

    result = sub_li + [data] + post_li
    # print(result)
    return result

lis = [1,2,3,4,5,6]
print(insertion(lis,0,0))
print(insertion(lis,0,3))
print(insertion(lis,0,len(lis)))

# Insert at Start
print("Self-Made Insert at Start: ", timeit.timeit("insertion(lis, 0, 0);",globals= globals(), number=500))
print("Built-in Insert at Start: ",
timeit.timeit("lis.insert(0,0)",globals= globals(), number=500))

# Insert at Middle
print("Self-Made Insert at Middle: ", timeit.timeit("insertion(lis, 0, 3);",globals= globals(), number=500))
print("Built-in Insert at Middle: ",
timeit.timeit("lis.insert(0,3)",globals= globals(), number=500))

# Insert at End
print("Self-Made Insert at End: ", timeit.timeit("insertion(lis, 0, - 1);",globals= globals(), number=500))
print("Built-in Insert at End: ", timeit.timeit("lis.insert(0,- 1)",globals= globals(), number=500))

# Output
[0, 1, 2, 3, 4, 5, 6]
[1, 2, 3, 0, 4, 5, 6]
[1, 2, 3, 4, 5, 6, 0]
Self-Made Insert at Start: 0.000152900000102818
Built-in Insert at Start: 0.00040060002356767654

Self-Made Insert at Middle: 0.0006438999553211033
Built-in Insert at Middle: 0.0010211000335402787

Self-Made Insert at End: 0.0033121000160463154
Built-in Insert at End: 0.0005599000141955912
```

## A2.2 Deletion

```
import timeit
def dele(li,data):
    index = li.index(data)
    sub_li = li[:index]
    post_li = li[index+1:]

    return sub_li + post_li

lis = [1,2,3,4,5,6]
print("Removed 1",dele(lis, 1))
print("Removed 3",dele(lis, 3))
print("Removed 6",dele(lis, 6))

lis = [1,2,3,4,5,6]

# Delete at Start
print("Self-Made Delete at Start: ", timeit.timeit("l = lis.copy();
dele(l, 1);",globals= globals(), number=500))
print("Built-in Delete at Start: ", timeit.timeit("l = lis.copy();
l.remove(1)",globals= globals(), number=500))

# Delete at Middle
print("Self-Made Delete at Middle: ", timeit.timeit("l = lis.copy();
dele(l, 3);",globals= globals(), number=500))
print("Built-in Delete at Middle: ", timeit.timeit("l = lis.copy();
l.remove(3)",globals= globals(), number=500))

# Delete at End
print("Self-Made Delete at End: ", timeit.timeit("l = lis.copy();
dele(l, 6);",globals= globals(), number=500))
print("Built-in Delete at End: ", timeit.timeit("l = lis.copy();
l.remove(6)",globals= globals(), number=500))

# Output
Removed 1 [2, 3, 4, 5, 6]
Removed 3 [1, 2, 4, 5, 6]
Removed 6 [1, 2, 3, 4, 5]
Self-Made Delete at Start: 0.00015570002142339945
Built-in Delete at Start: 4.980002995580435e-05

Self-Made Delete at Middle: 0.00016250001499429345
Built-in Delete at Middle: 5.8100034948438406e-05

Self-Made Delete at End: 0.00017479999223724008
Built-in Delete at End: 7.289997301995754e-05
```

## A2.3 Searching

```
import timeit
def search(li, data):
    for i in range(len(li)):
        if li[i] == data:
            return i

lis = ["a","b","c","d","e",]
print(lis)
print("Index of a",search(lis, "a"))
print("Index of c",search(lis, "c"))
print("Index of e",search(lis, "e"),"\n")

# Search at Start
print("Self-Made Search at Start: ",
timeit.timeit("search(lis,'a')",globals= globals(), number=500))
print("Built-in Search at Start: ",
timeit.timeit("lis.index('a')",globals= globals(), number=500))

# Search at Middle
print("Self-Made Search at Middle: ",
timeit.timeit("search(lis,'c')",globals= globals(), number=500))
print("Built-in Search at Middle: ",
timeit.timeit("lis.index('c')",globals= globals(), number=500))

# Search at End
print("Self-Made Search at End: ",
timeit.timeit("search(lis,'e')",globals= globals(), number=500))
print("Built-in Search at End: ",
timeit.timeit("lis.index('e')",globals= globals(), number=500))

# Output

['a', 'b', 'c', 'd', 'e']
Index of a 0
Index of c 2
Index of e 4

Self-Made Search at Start: 0.00010010000551119447
Built-in Search at Start: 2.4200009647756815e-05

Self-Made Search at Middle: 0.00013180001405999064
Built-in Search at Middle: 1.9499973859637976e-05

Self-Made Search at End: 8.890003664419055e-05
Built-in Search at End: 2.400000812485814e-05
```