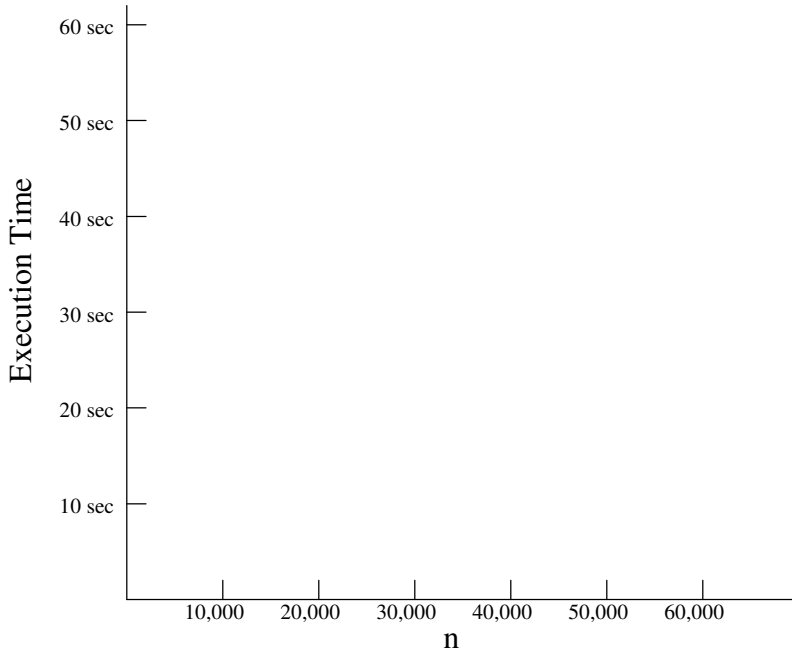


1. Draw the graph for `sumList` ($O(n)$) and `someLoops` ($O(n^2)$) from the previous lecture.



2. Consider the following `sumSomeListItems` function.

```
import time

def main():
    n = eval(input("Enter size of list: "))
    aList = list(range(1, n+1))
    start = time.clock()
    sum = sumSomeListItems(aList)
    end = time.clock()
    print("Time to sum the list was %.9f seconds" % (end-start))

def sumSomeListItems(myList):
    """Returns the sum of some items in myList"""
    total = 0
    index = len(myList) - 1
    while index > 0:
        total = total + myList[index]
        index = index // 2
    return total

main()
```

a) What is the problem size of `sumSomeListItems`?

b) If we input `n` of 10,000 and `sumSomeListItems` takes 10 seconds, how long would you expect `sumSomeListItems` to take for `n` of 20,000?

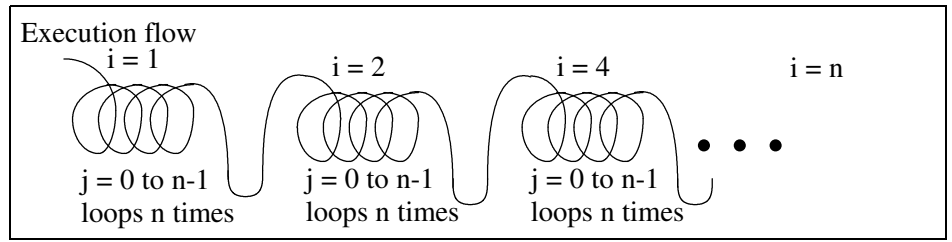
(Hint: For `n` of 20,000, how many more times would the loop execute than for `n` of 10,000?)

c) What is the big-oh notation for `sumSomeListItems`?

d) Add the execution-time graph for `sumSomeListItems` to the graph.

```

3.
i = 1
while i <= n:
    for j in range(n):
        # something of O(1)
    # end for
    i = i * 2
# end while
    
```



a) Analyze the above algorithm to determine its big-oh notation, $O()$.

b) If n of 10,000, takes 10 seconds, how long would you expect the above code to take for n of 20,000?

c) Add the execution-time graph for the above code to the graph.

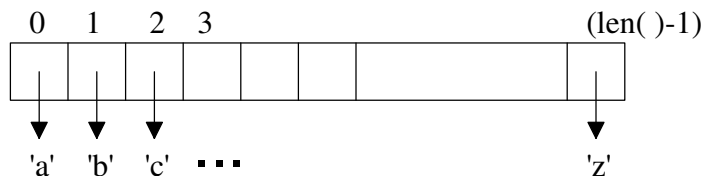
4. Most programming languages have a built-in array data structure to store a collection of same-type items. Arrays are implemented in RAM memory as a contiguous block of memory locations. Consider an array X that contains the odd integers:

address	Memory	
4000	1	$X[0]$
4004	3	$X[1]$
4008	5	$X[2]$
4012	7	$X[3]$
4016	9	$X[4]$
4020	11	$X[5]$
4024	13	$X[6]$
⋮		

a) Any array element can be accessed randomly by calculating its address. For example, address of $X[5] = 4000 + 5 * 4 = 4020$. What is the general formula for calculating the address of the i th element in an array?

b) What is the big-oh notation for accessing the i th element?

c) A Python list uses an array of references (pointers) to list items in their implementation of a list. For example, a list of strings containing the alphabet:



Since a Python list can contain heterogeneous data, how does storing references in the list aid implementation?

