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I hereby pledge on my honor that I will strictly adhere to academic integrity codes and the work done on this examination is solely my own and I will not receive/give any help from/to anybody or source during this examination

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1) $C = \frac{1}{2}\left(1 + \frac{1}{1-L}\right)$, number of comparisons in open addressing

$C = 1 + \frac{L}{2}$, number of comparisons in chaining → by load factor

a) $\frac{1}{2}\left(1 + \frac{1}{1 - \frac{400}{size}}\right) < 3 \Rightarrow 1 + \frac{1}{1-\frac{400}{size}} < 6\ 5$

$\frac{size}{size-400} < 5 \Rightarrow$ **size > 500**

b) $1 + \frac{\frac{400}{size}}{2} < 3 \Rightarrow \frac{400}{2*size} < 2 \Rightarrow \frac{400}{size} < 4$

size > 100

3) [3, 4, 7, 6, 9]

↳ less than

a) 3 4 7 6 9

no swap, curr index

3 4 6 7 9

greater, current index

3 4 6 7 9

curr index

TComp = 5

d) [3 4 7 6 9]

3 4 — comp=1 — [3,6]

7 6 9 → 6,9 — comp=1 — [6,9] → [7] → [6,7,9] comp=2

[3,6] + [6,7,9] → [3,4,6,7,9] comp=2

TComp = 6

Start from left, swap the current element until it is not smaller than the element

c) [3, 4, 7, 6, 9]

index, swap with 9

9, 4, 7, 6, 3

left ↑↑ right ptrs Comp = 4 (with the pivot '3')

[3], 4, 7, 6, 9

[3], 9, 7, 6, 4

↑↑ comp = 3

compares pivot with the rest of the elements

[3], [4], 7, 6, 9

comp = 2

[3], [4], 7, 6, [9]

comp = 1

[3], [4], [6], [7], [9]

TComp = 10

b) [3, 4, 7, 6, 9]

gap = 3

3 4 7 6 9

↑ ↑

comp = 1

3 4 7 6 9

↑ ↑

comp = 1

gap = 1

3 4 7 6 9

(It is insertion sort from now)

comp = 5

TComp = 7

2) In quadratic probing we increase index numbers by 1, 2, 4, 9, 16, ... So it's works better for creating unique index numbers when we encounter a collision.

But array size should be prime number and load factor should be less than 0.5 to not get into an endless loop, while trying to find an index.

And it reduces the number of collisions for the next key values