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CH-17

1) Inserting n elements using

i) Aggregate method

* Pseudo Code:

```
Initialize table with capacity = 1
for i = 1 to n:
    if table is full:
        newtable = create new table with size 2 * current size
        Copy elements from old table to newtable
        table = newtable
    insert element i into table
```

Let $K = \log(n+1) - 1$

Total Cost $= O(n) * K$

$= O(n \log n)$

Cost per insertion $= O(\log n)$

Runtime per insertion is $O(\log n)$

Total time is $O(n) * \log(n+1)$

(b) Accounting method →

Pseudo Code →

```
initially table with capacity = 1
for i = 1 to n:
    if table is full:
        new table = Create new table with size 2 * Current size
        Copy element from old table to new table
        table = new table
    insert element i into table
    initially charge = 0
    initially credits = 0

for i = 1 to n:
    charge += 2
    if table doubled in size from m to 2m
    Credits $ += m
```

Total charges = $2 * n = O(n)$

Total Credits = $m + 2m + \dots n/2 * m = O(n)$

Amortized cost per insertion = Total / n

$= O(n/n)$

$= O(1)$

Runtime per insertion = $O(1)$

Total time = $O(n)$