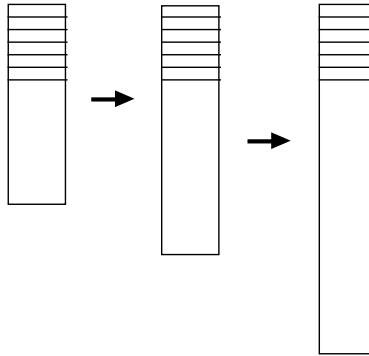


Dynamic Growth & Double Hashing

Concept: When the load factor (α) reaches a **fixed** threshold, either (1) build a new double hash table whose size is fractionally larger (n) than the old table (cn) or (2) build a new double hash table whose size (n) is a fixed constant larger than the old table ($n - c$).



Analysis of expected insertion cost alone

Fractional Growth:

$T(n) = T(cn) + dn$ where d is based on initializing new table
and (total) expected insertion cost to reach α .

$O(n)$ by substitution method:

Assume $T(k) \leq ek$ for $k < n$

$T(cn) \leq ecn$ for $c < 1$

$T(n) \leq ecn + dn$

$= en + dn + (ec - e)n$

$\leq en$ if $e - ec \geq d$

Fixed Growth:

$T(n) = T(n - c) + dn$ where d is based on initializing new table
and expected insertion cost to reach α .

$O(n^2)$ by substitution method

Assume $T(k) \leq ek^2$ for $k < n$

$T(n - c) \leq e(n - c)^2 = en^2 - 2cen + ec^2$

$T(n) \leq en^2 - 2cen + ec^2 + dn$

$\leq en^2$ if $2ce \geq d$ (ignoring ec^2)