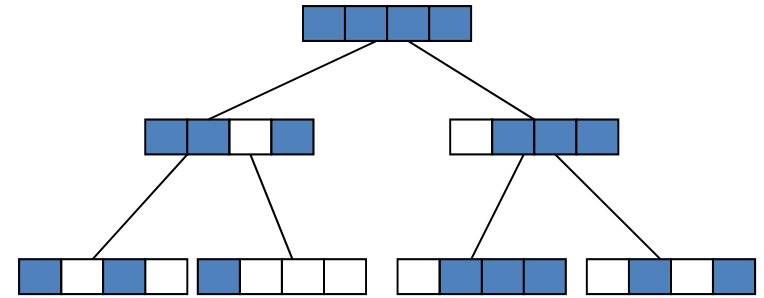# Review: GHT

- Which of the following statement(s) is(are) TRUE concerning the Generalized Hash Tree where $m_0=m_1=\ldots=4$ (i.e., size of tree nodes at all levels are 4) and $k_0=k_1=\ldots=2$ (growth factor is the same for all levels)?
  - It is height-balanced.
  - It is order-dependent (i.e., the tree shape may be different if the same input data are ordered differently).
  - It guarantees a lower bound on storage utilization.
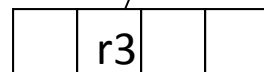
Is GHT height-balanced?

Insert a sequence of records that has the same hash values at various levels, say r1, r2 and r3
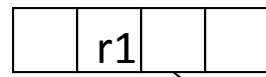
$h0(key) = 1$
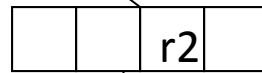
$h1(key) = 6$

$h2(key) = 1$
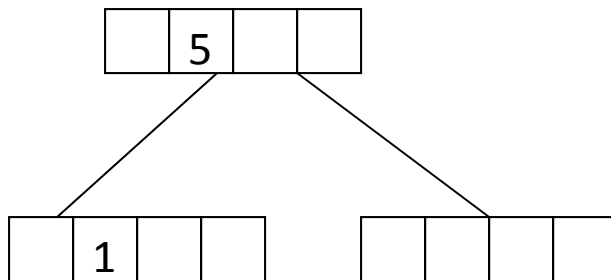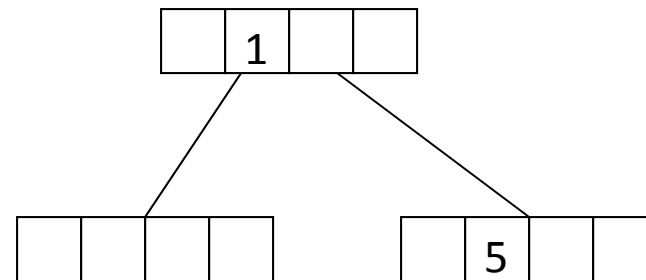
$h3(key) = 3$

Is GHT order-dependent?

- Let's consider insertion of values 1 and 5.
- Hash functions
  - Level 0: x mod 4
  - Level 1: x^3 mod 8

Insert order: 5, 1   Insert order: 1, 5

Does GHT guarantee minimum utilization?

- Yes
- In general,
  - If a node j has m_j buckets/entries, then it guarantees $1/\max(m_j)$ space utilization
  - This is quite a meaningless bound