



# Solution

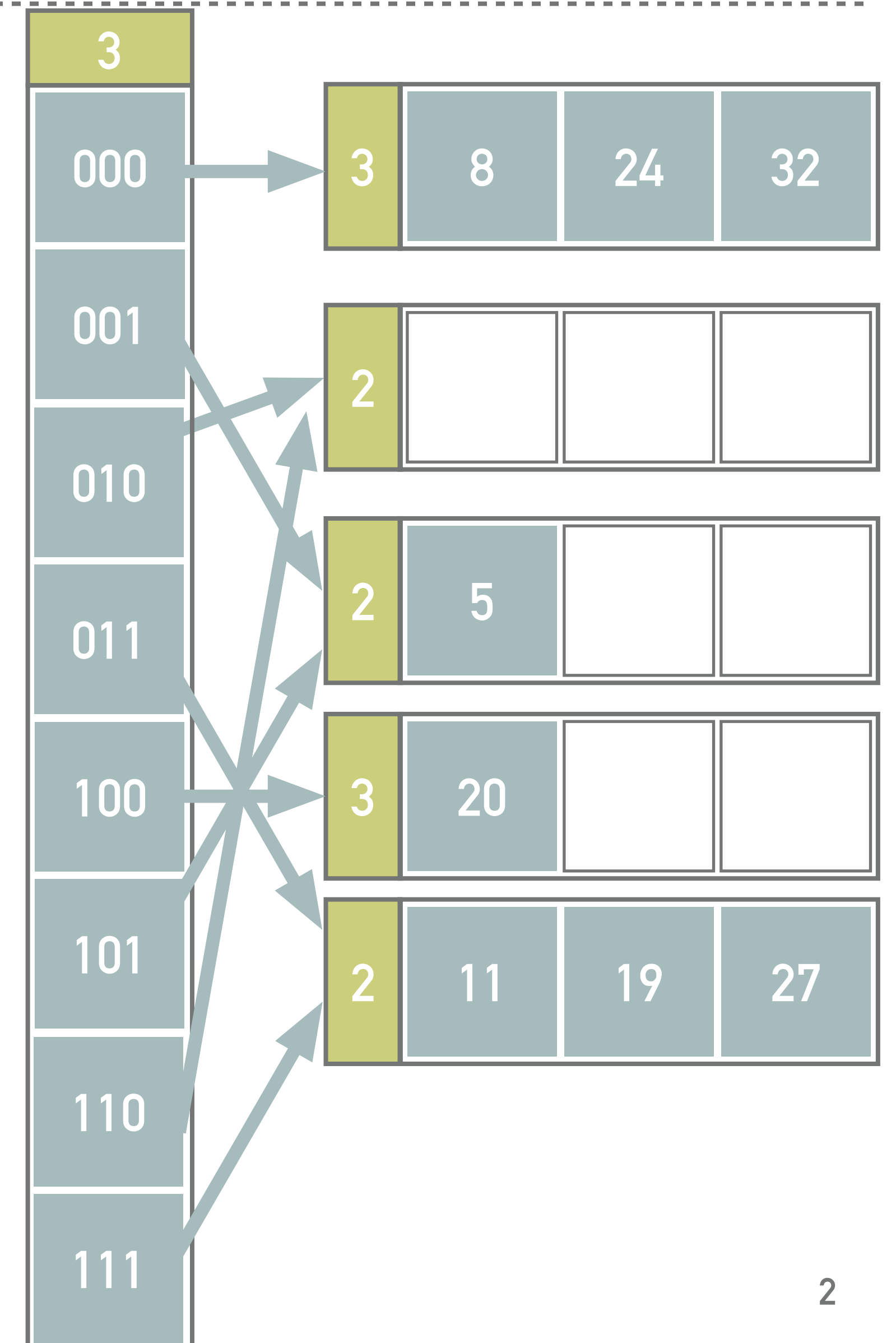
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*NDBI007: Practical class 4*



# Exercise 4.4 (Solution)

- ❖  $h(24_{10}) = 11000_2$
- ❖  $h(32_{10}) = 100000_2$
- ❖ The second insert splits the page pointed by entry 0 (i.e.,  $d_L < d_G$ ) into two pages pointed by entries 00, 01 respectively, and the incrementation  $d_L = 2$  occurs
- ❖ Nevertheless, all the keys 8, 20, 24, and 32 belong to the page pointed by entry 00, therefore additional split is needed
  - ❖  $d_L = d_G = 2$ , forcing the directory to be expanded to eight entries, i.e., global depth is incremented  $d_G = 3$
  - ❖ Subsequently, the page 00 is split to 000 and 1000 and respective local depth is incremented to  $d_L = 3$
  - ❖ Finally, the records from split page are reinserted:
    - ❖ Records with keys 8, 24, and 32 go into page 000
    - ❖ Record with key 20 is accommodated in the page 100



# Exercise 4.7 (Solution)

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❖ The records with keys 27, and 19 are inserted into page 11

❖  $h(27_{10}) = 11011_2$

❖  $h(19_{10}) = 10011_2$

❖ We have already inserted 2 records in the stage  $d = 2$ , therefore page  $p_0 = 00$  is split into pages  $p_0 = 000$ ,  $p_1 = 100$  and the records are redistributed into the new pages,  $p = 1$

❖  $h(20_{10}) = 10100_2$

❖  $h(8_{10}) = 1000_2$

❖  $h(24_{10}) = 11000_2$

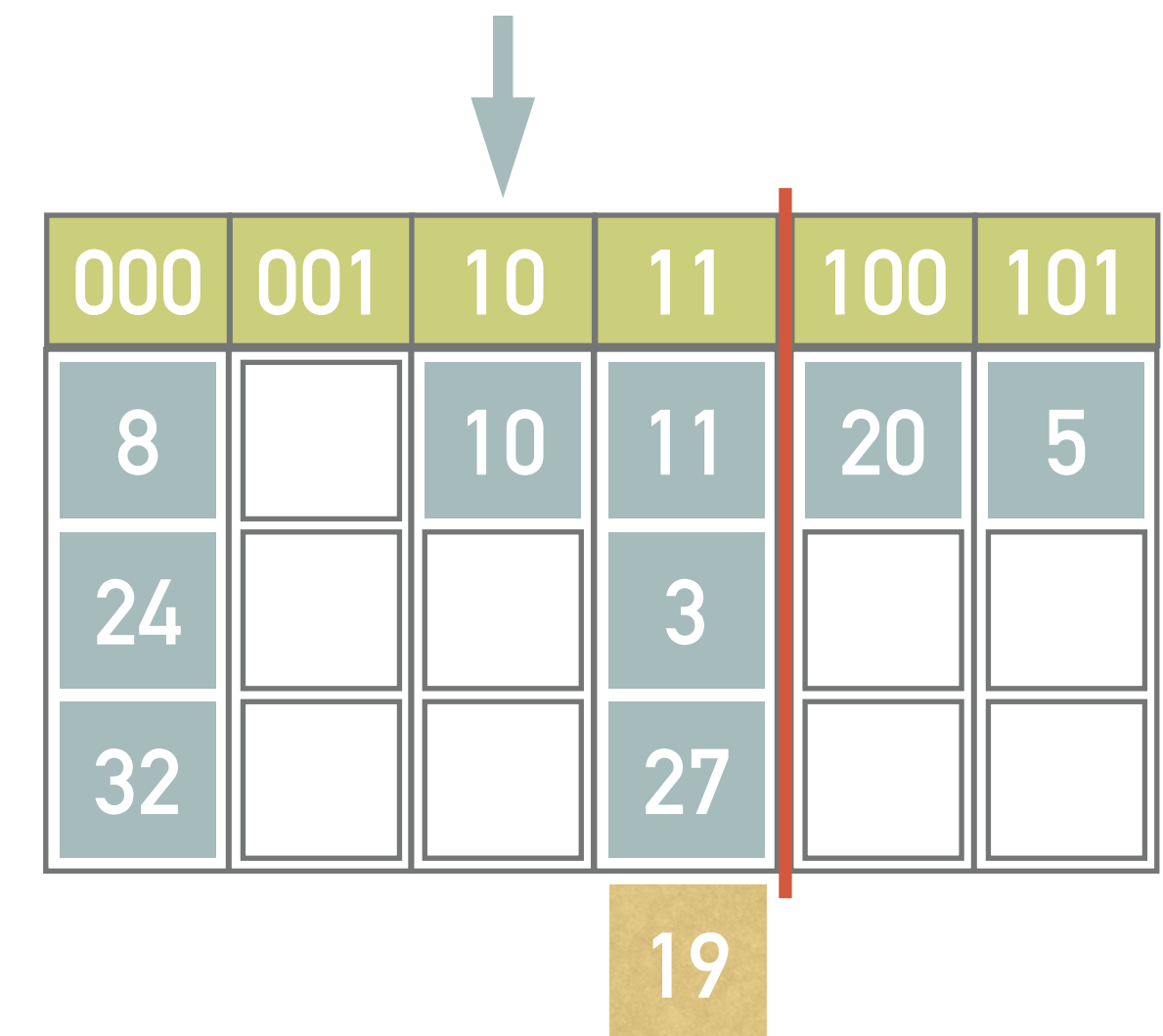
❖  $h(32_{10}) = 100000_2$

❖ Next, we insert records with keys 10 (into the page 11) and 5 (into the page 01)

❖  $h(10_{10}) = 1010_2$

❖  $h(5_{10}) = 101_2$

❖ Having inserted additional 2 records, we split the page 01 into pages  $p_0 = 001$ ,  $p = 1,101$ , redistribute the record 5 from page 01, and we set  $p = 2$



## Exercise 4.9 (Solution)

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- ❖ The hash function  $h_0(37) = 37 \bmod 4 = 1$  sends the record with key 37 into page 1
- ❖ That page has already been split, therefore the  $h_1$  must be used
- ❖  $h_1(37) = 37 \bmod 3 = 1$  sends the key 37 into page 3
- ❖ This page has already been split in this stage as well
- ❖ Finally,  $h_2(37) = (37 \div 3) \bmod 3 = 0$  sends the record to the page 0

