THE UNIVERSITY *of* EDINBURGH

Advanced Database Systems

Spring 2024

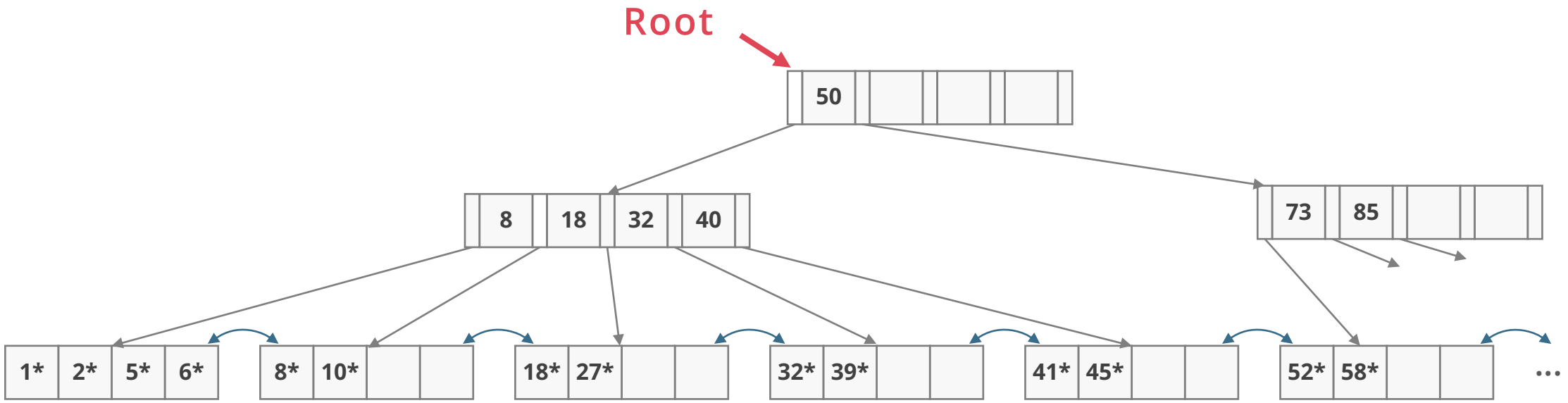
Tutorial 2

Question 3

B+ Tree: Search for 39

Find key = 39

- Find split on each node
- Follow pointer to next node

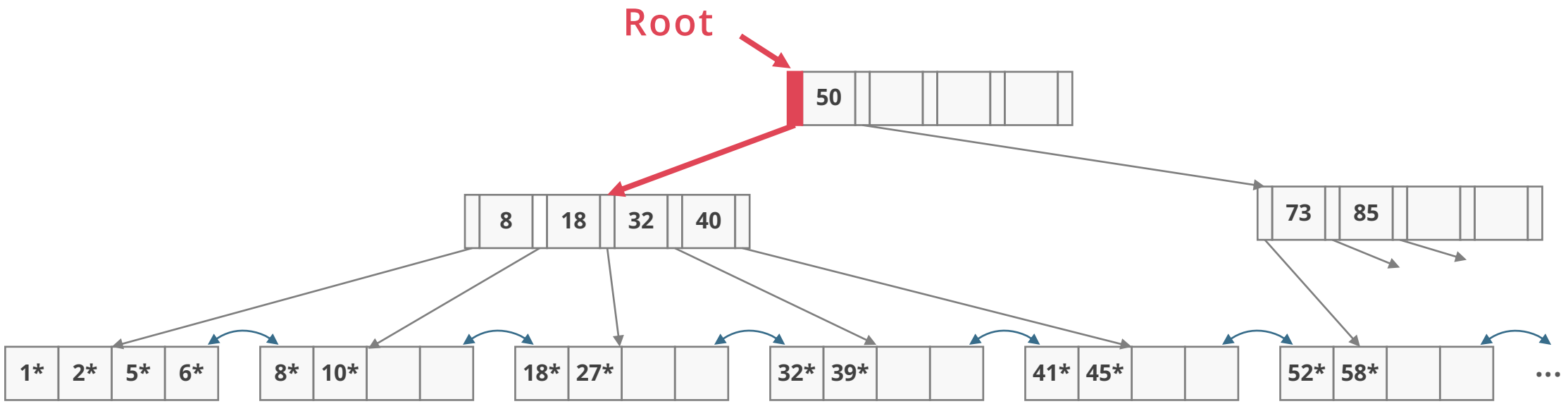


B+ Tree: Search for 39

Find key = 39

- Find split on each node
- Follow pointer to next node

Use binary search on each page

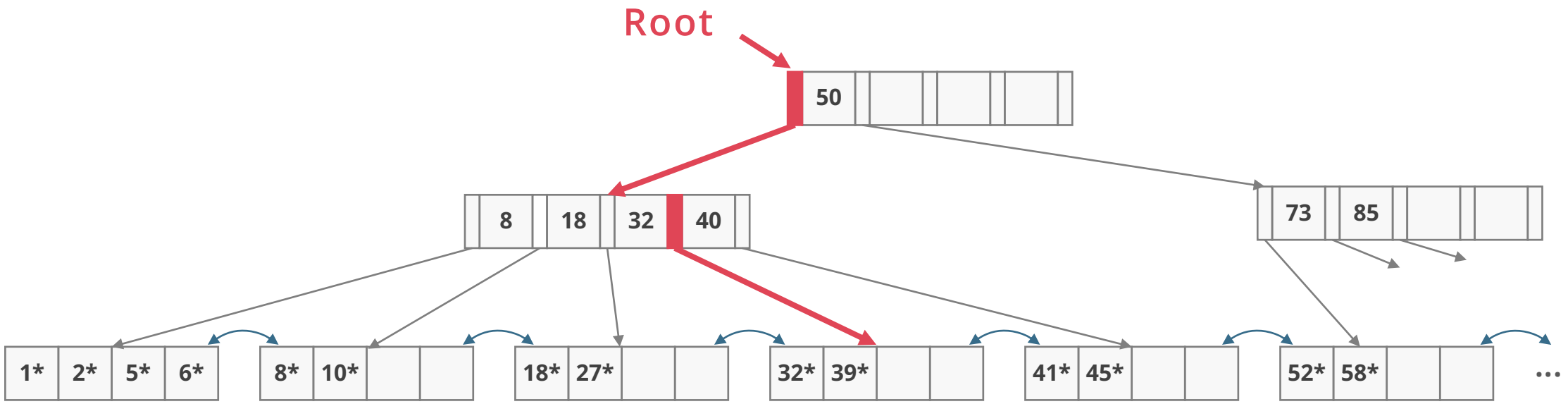


B+ Tree: Search for 39

Find key = 39

- Find split on each node
- Follow pointer to next node

Use binary search on each page

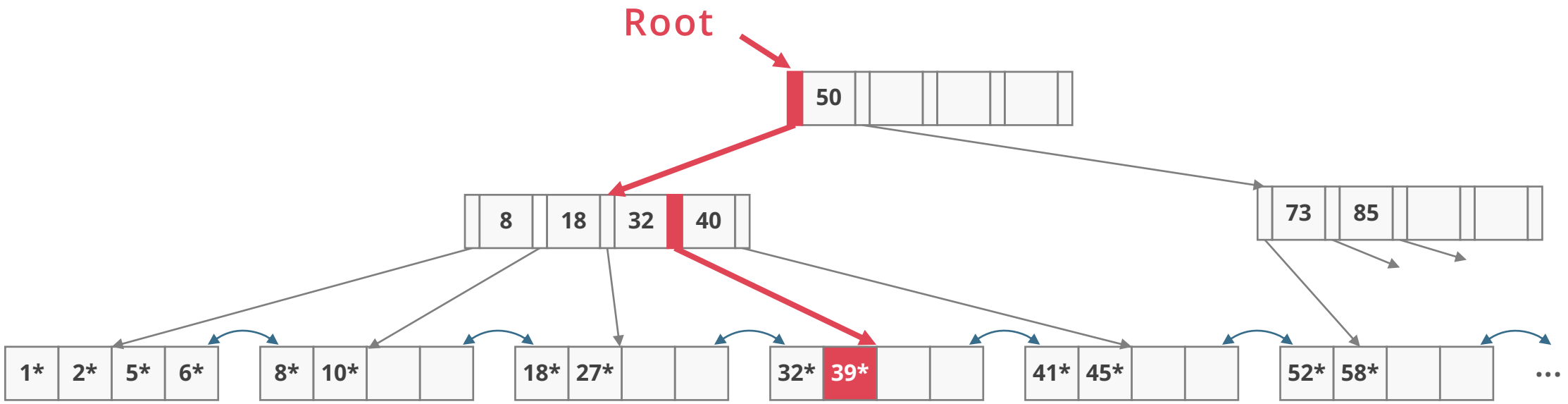


B+ Tree: Search for 39

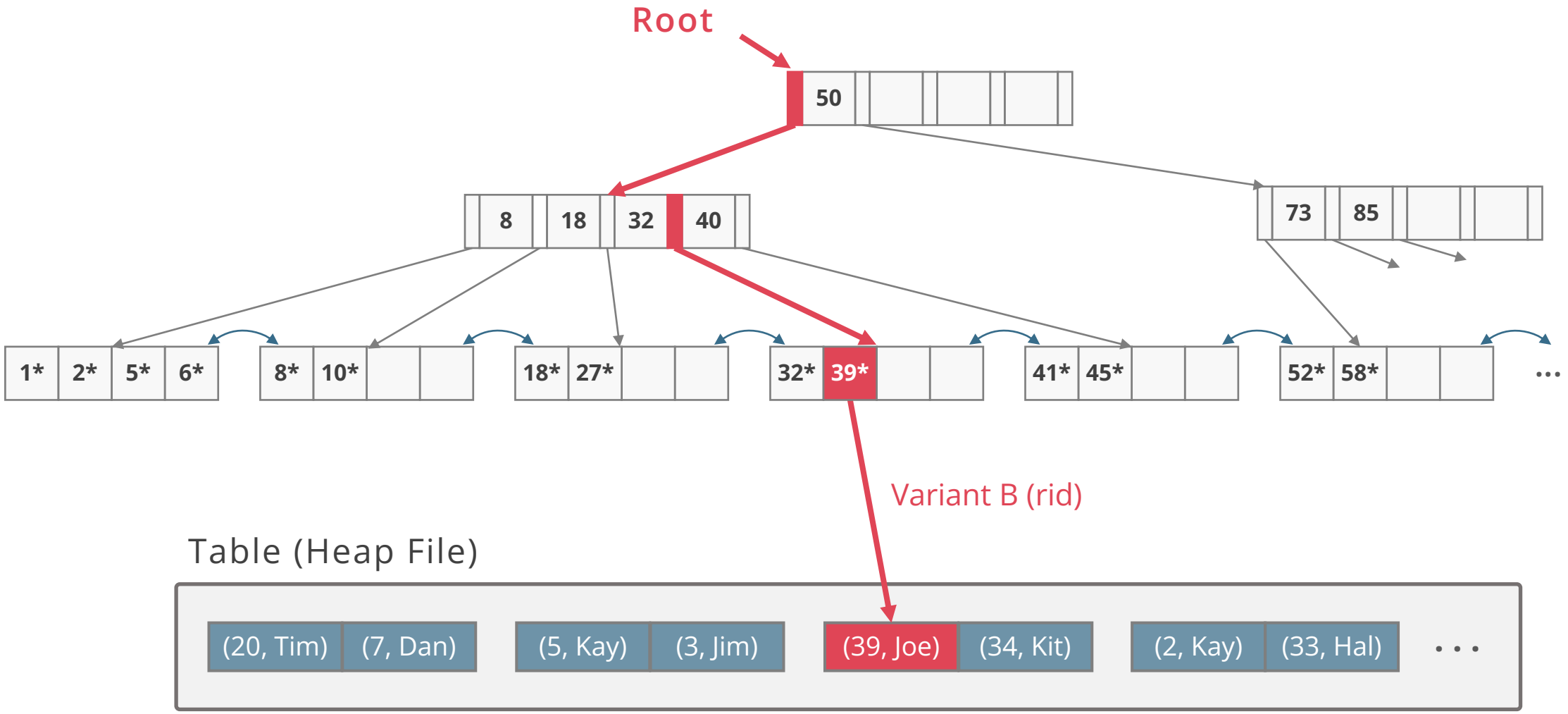
Find key = 39

- Find split on each node
- Follow pointer to next node

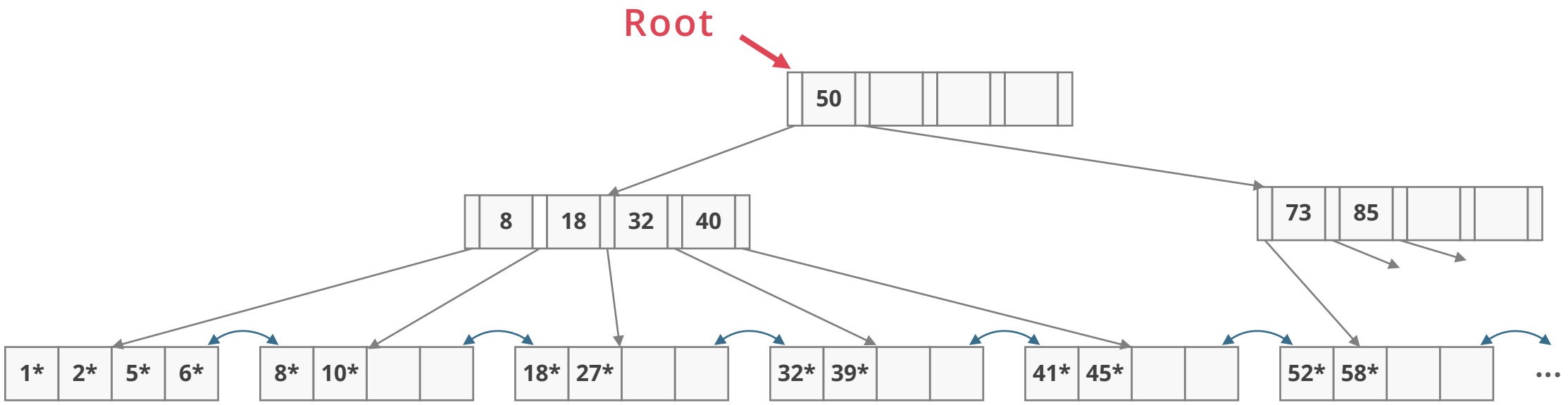
Use binary search on each page



B+ Tree: Search for 39



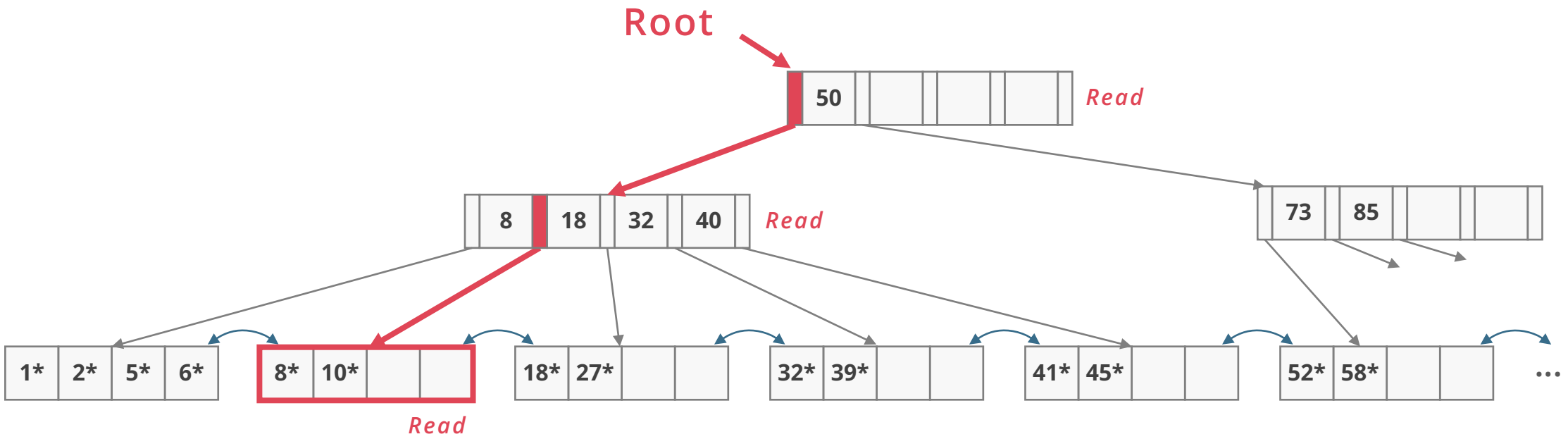
B+ Tree: Insert Entry 9*



I/O Total (so far): 0

B+ Tree: Insert Entry 9*

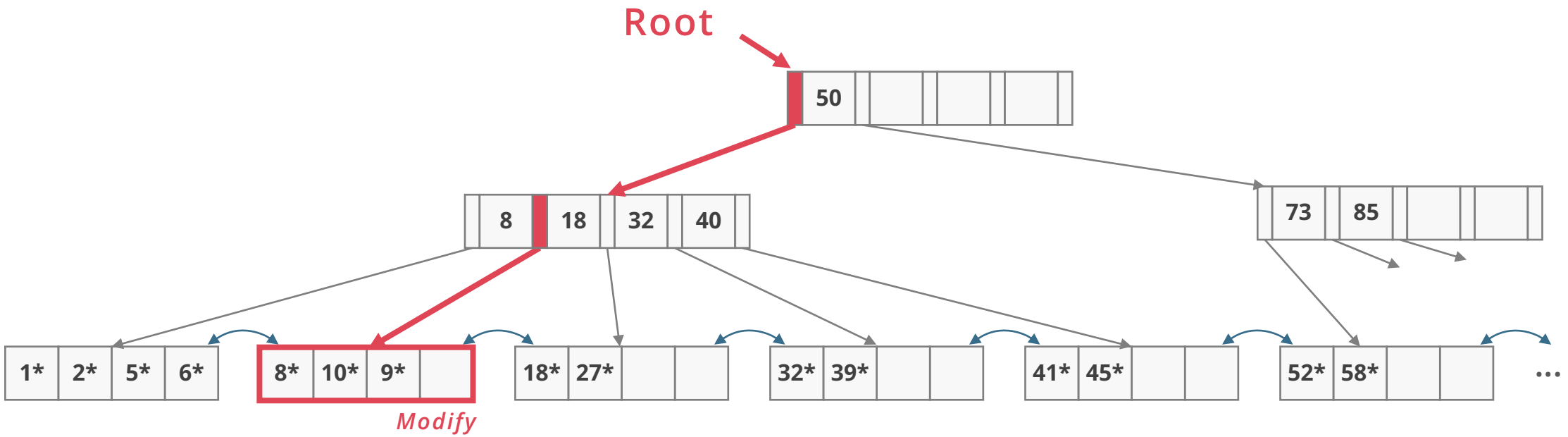
Find the correct leaf node



I/O Total (so far): 3

B+ Tree: Insert Entry 9*

If there is room in leaf, just add the entry

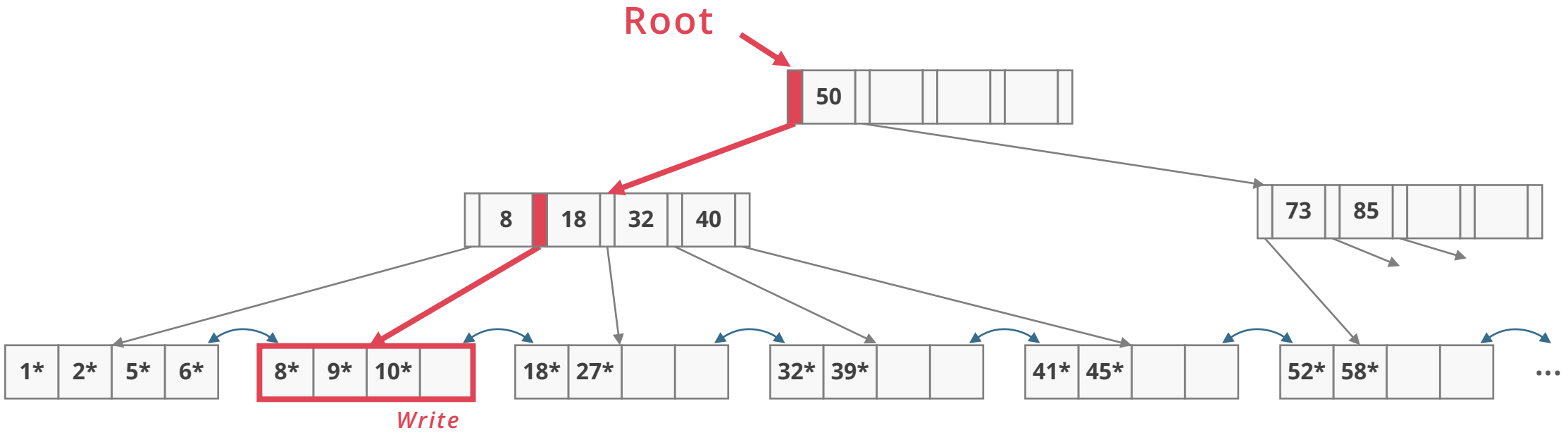


I/O Total (so far): 3

B+ Tree: Insert Entry 9*

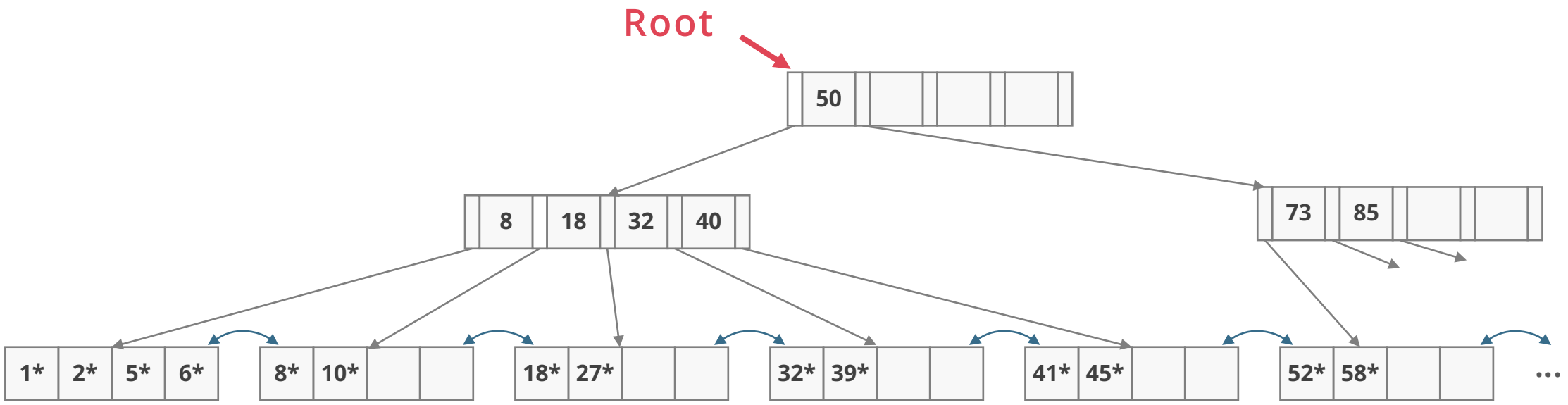
If there is room in leaf, just add the entry

... and keep the leaf sorted



I/O Total (so far): 4

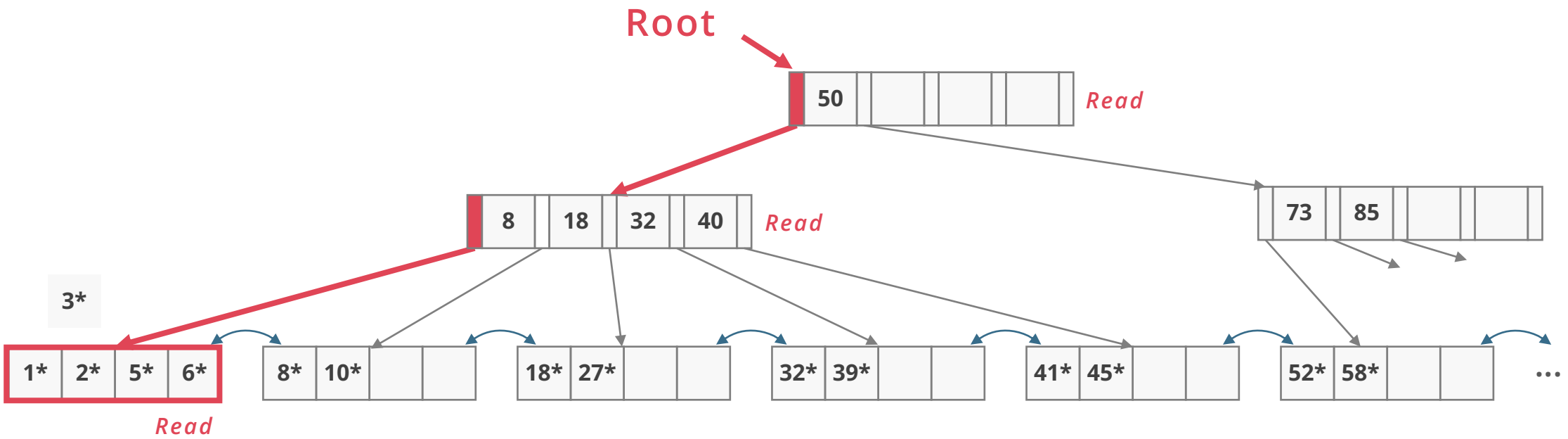
B+ Tree: Insert Entry 3*



I/O Total (so far): 0

B+ Tree: Insert Entry 3*

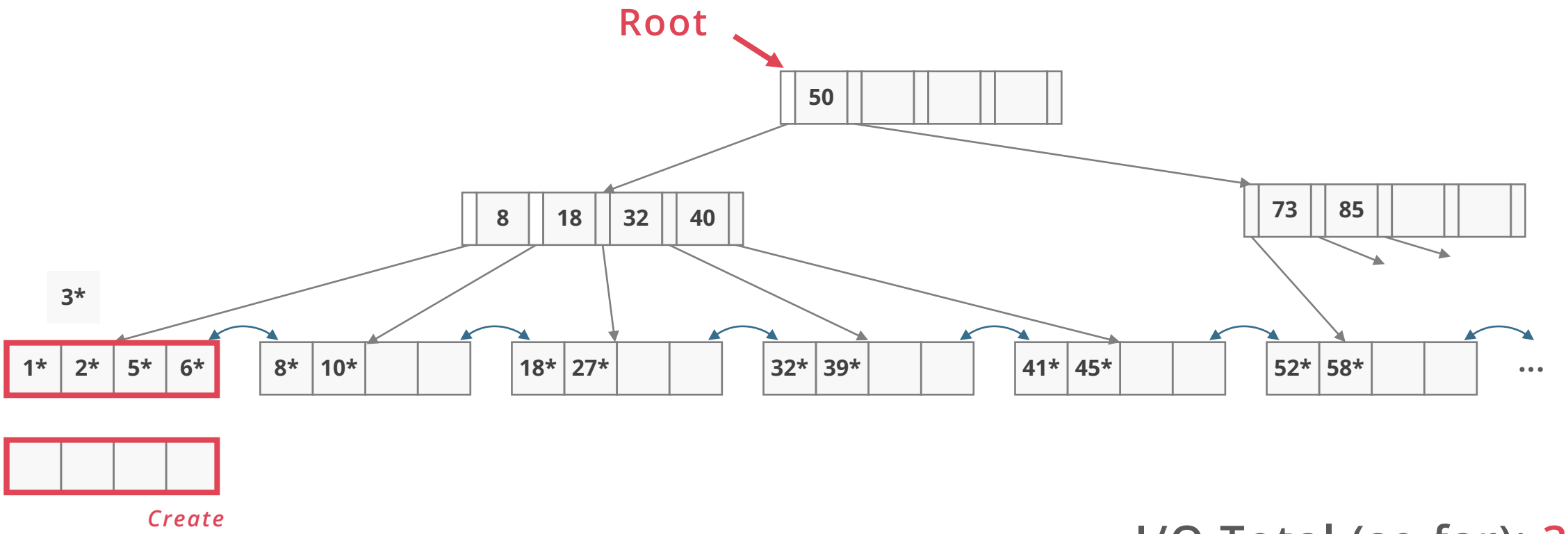
Find the correct leaf node



I/O Total (so far): 3

B+ Tree: Insert Entry 3*

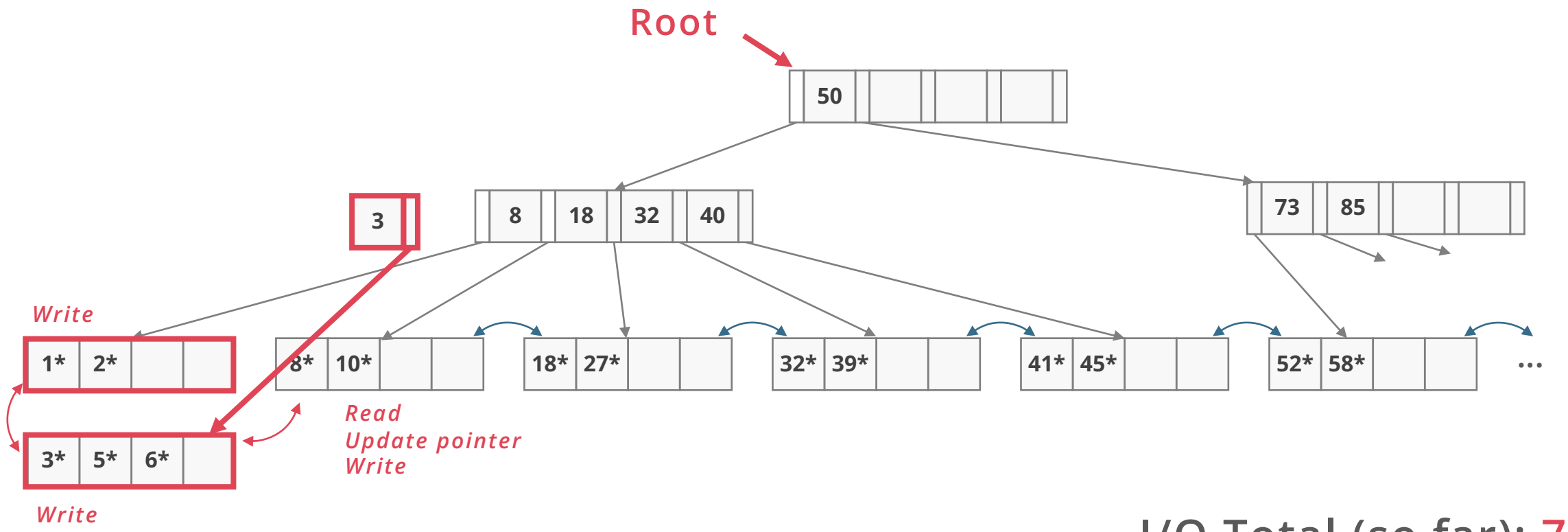
Split leaf if not enough room: into two leaves with **d** and **d + 1** entries



I/O Total (so far): 3

B+ Tree: Insert Entry 3*

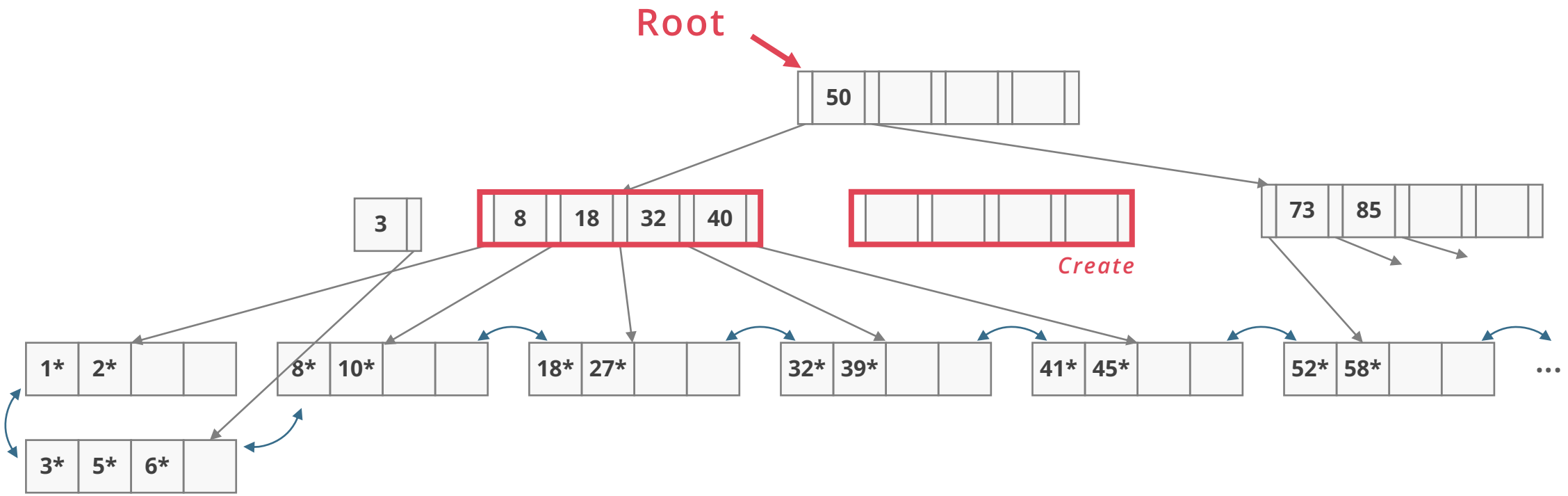
Copy up the middle key to inner node (since leaf nodes have data)



I/O Total (so far): 7

B+ Tree: Insert Entry 3*

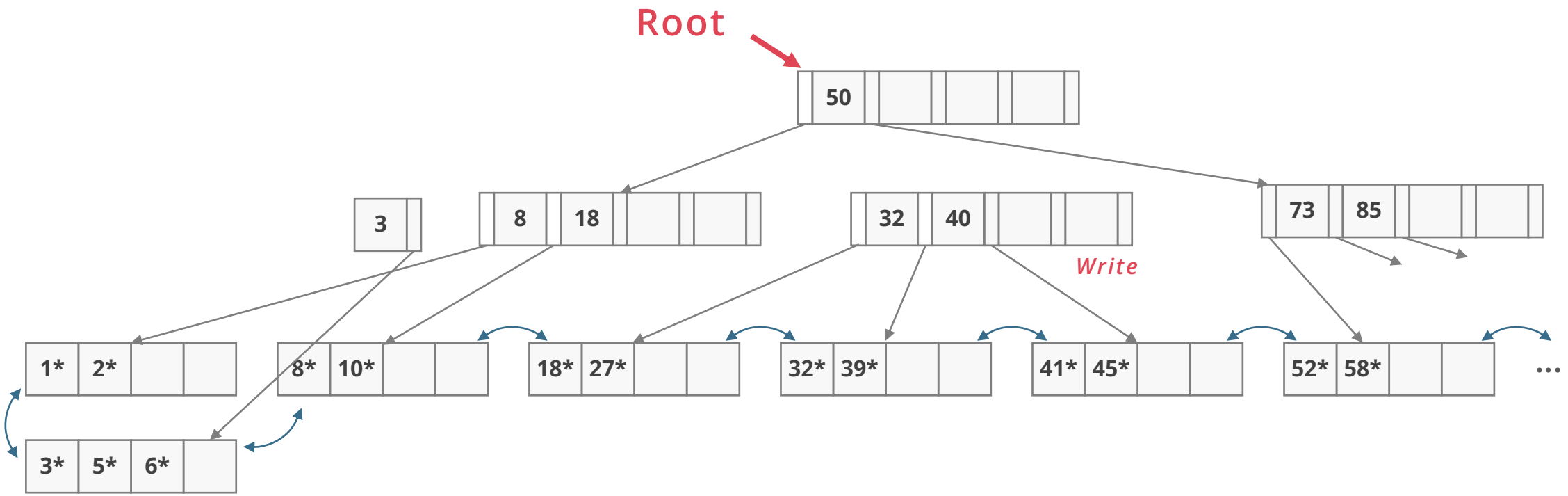
If inner node is full, split the inner node into two and **push** the middle key up



I/O Total (so far): 7

B+ Tree: Insert Entry 3*

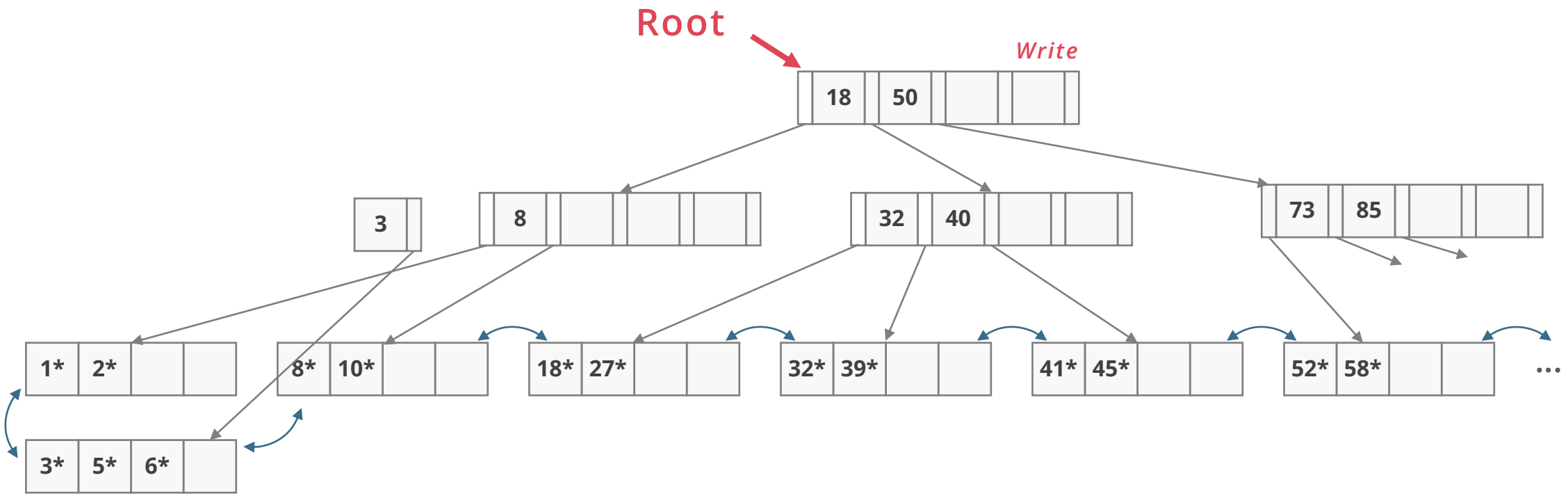
If inner node is full, split the inner node into two and **push** the middle key up



I/O Total (so far): 8

B+ Tree: Insert Entry 3*

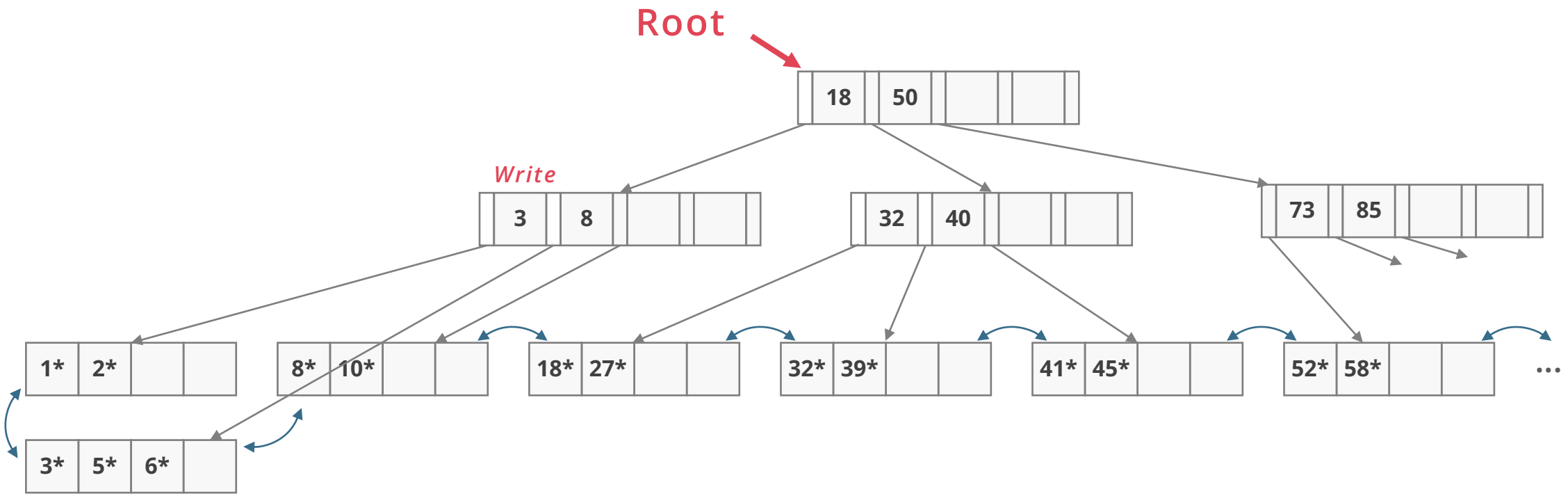
If inner node is full, split the inner node into two and **push** the middle key up



I/O Total (so far): 9

B+ Tree: Insert Entry 3*

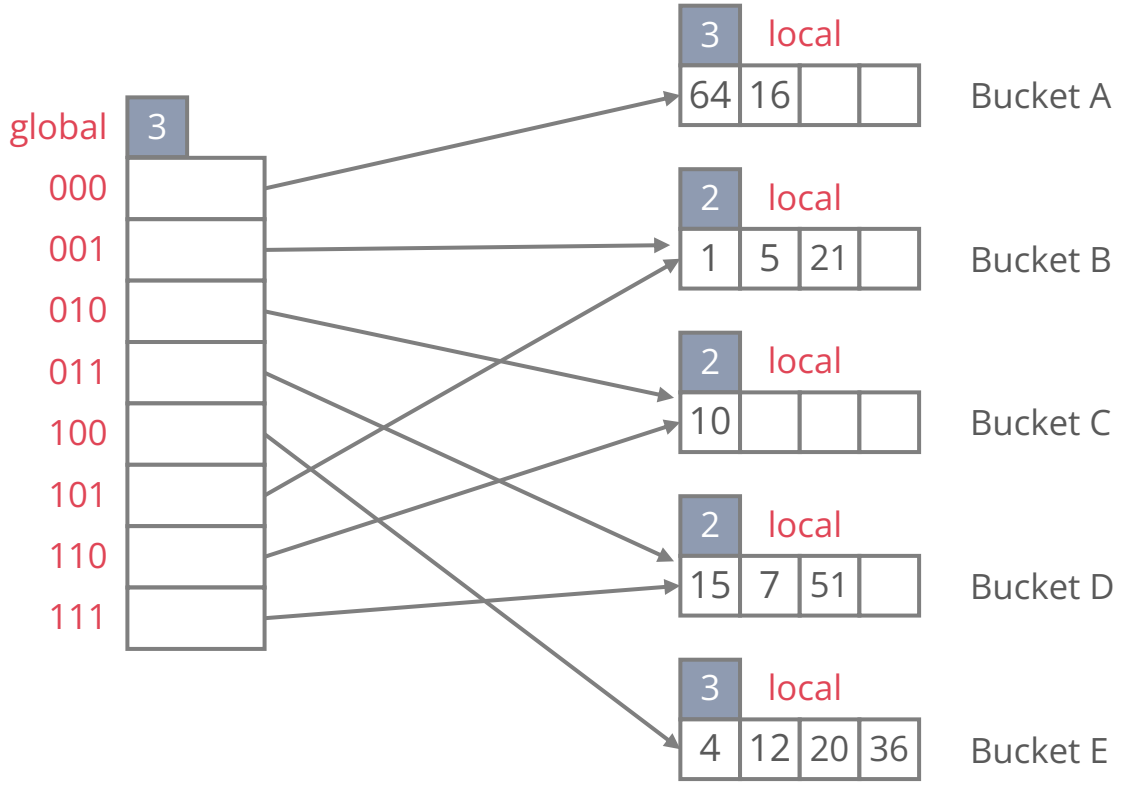
If inner node is full, split the inner node into two and **push** the middle key up



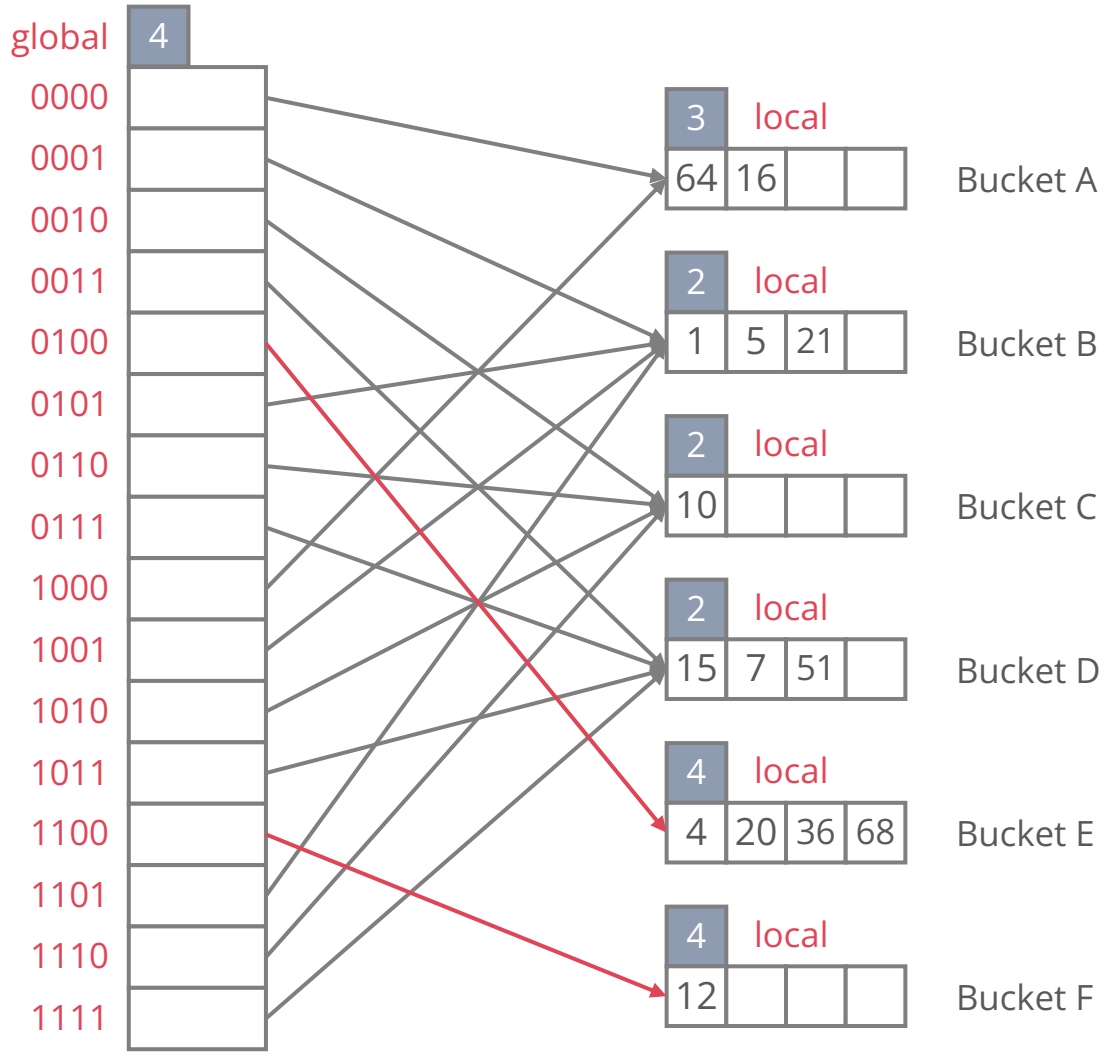
I/O Total (so far): 10

Question 4

Extendible Hashing



INSERT ENTRY WITH HASH VALUE 68



INSERT ENTRIES WITH HASH VALUES 17 & 69