Outline

- Binary search trees
- Selection trees

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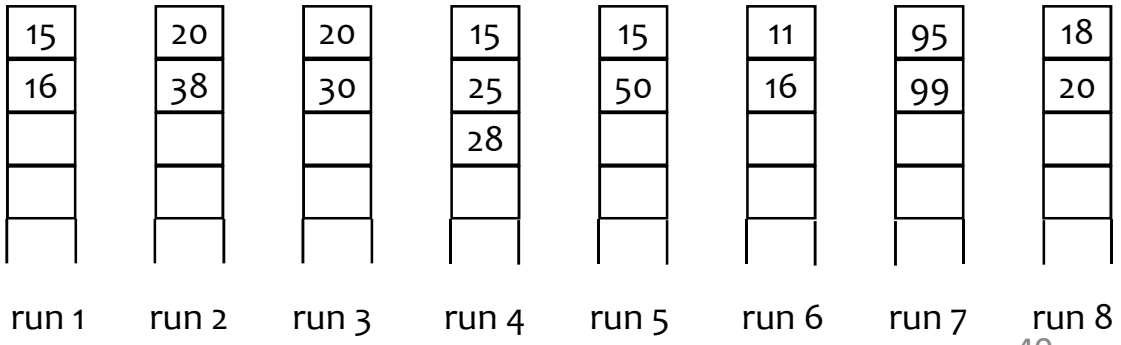
Merging k ordered list (run)

- Merged list must be ordered
- Need to find the smallest among k runs
  - k-1 comparison per element
  - Expensive if k is large
- Better solution: Selection Trees (winner or loser)



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Winner Trees

- Ideas
  - Compare O(log k) instead O(k)
- Complete binary tree
  - Leaf : smallest from each run
  - Non-leaf : winner among two children

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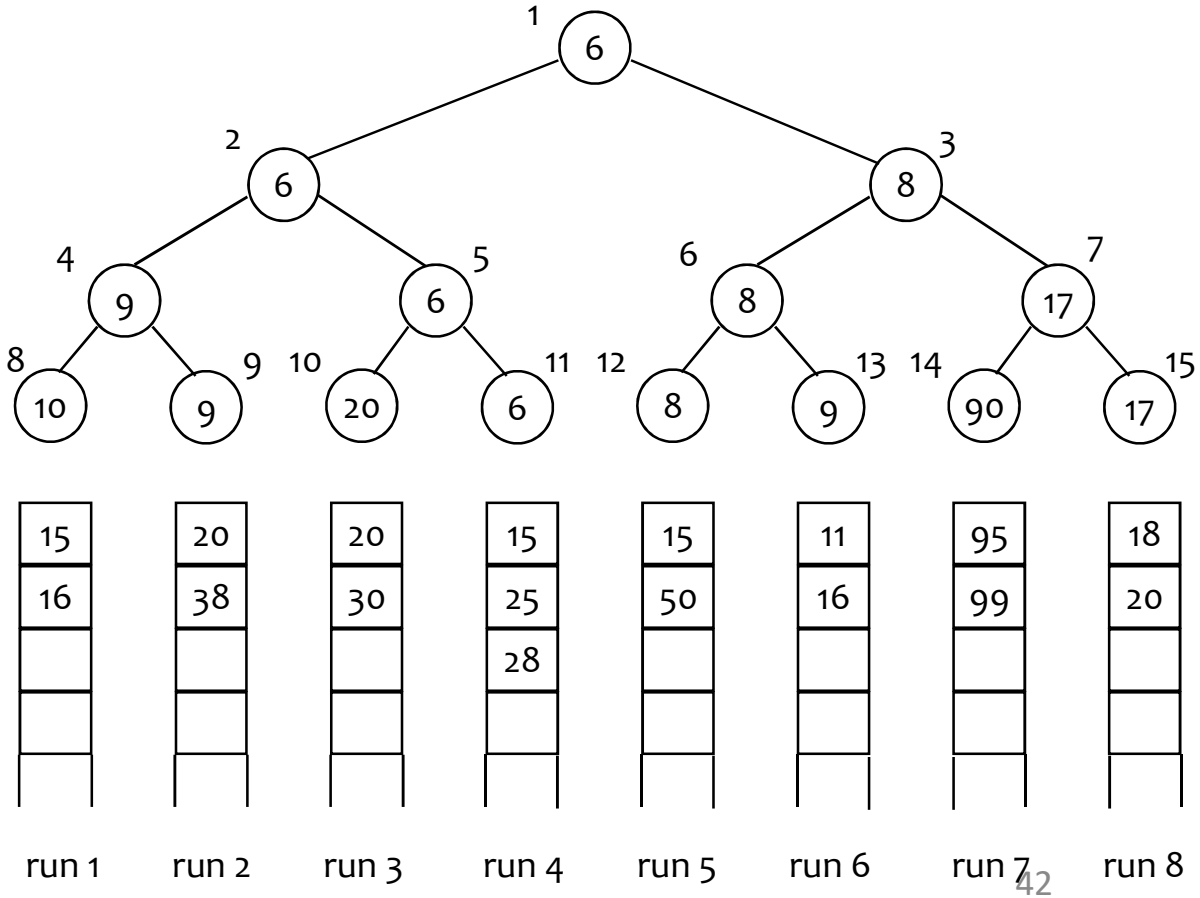
Example of Winner Tree

- 6 is the smallest among 8 values



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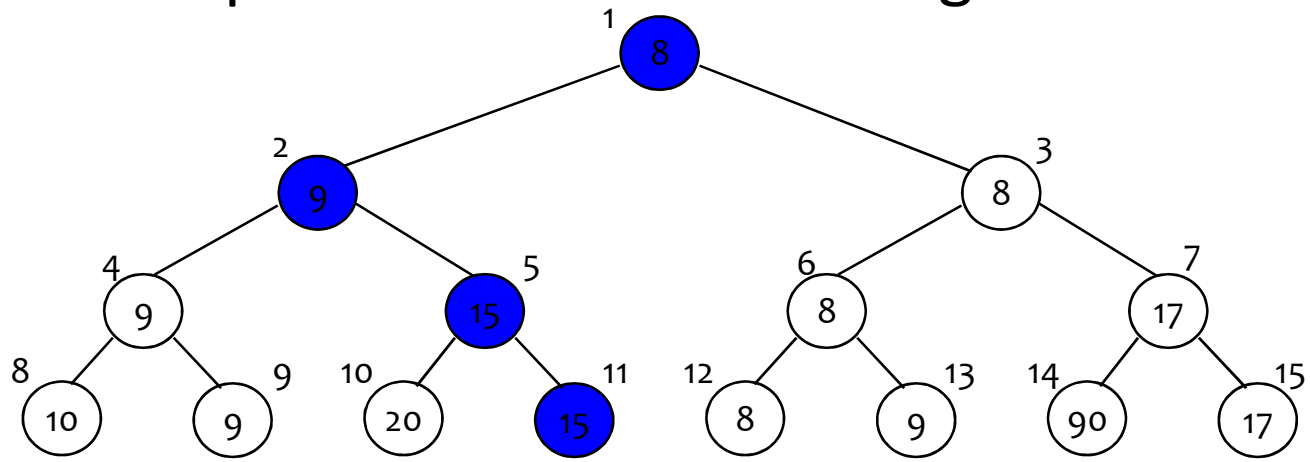
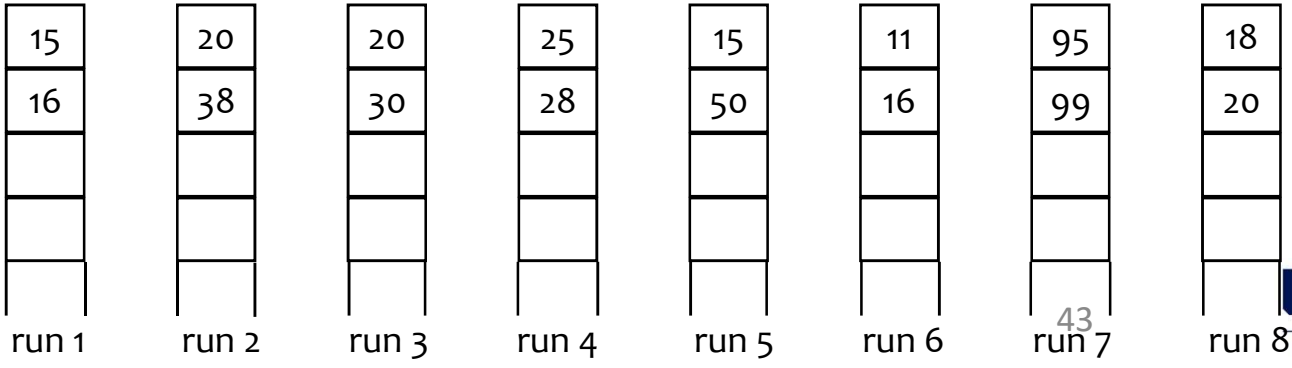
Example of Winner Tree

- Add next element from run 4 to the tree
  - Need comparisons between siblings





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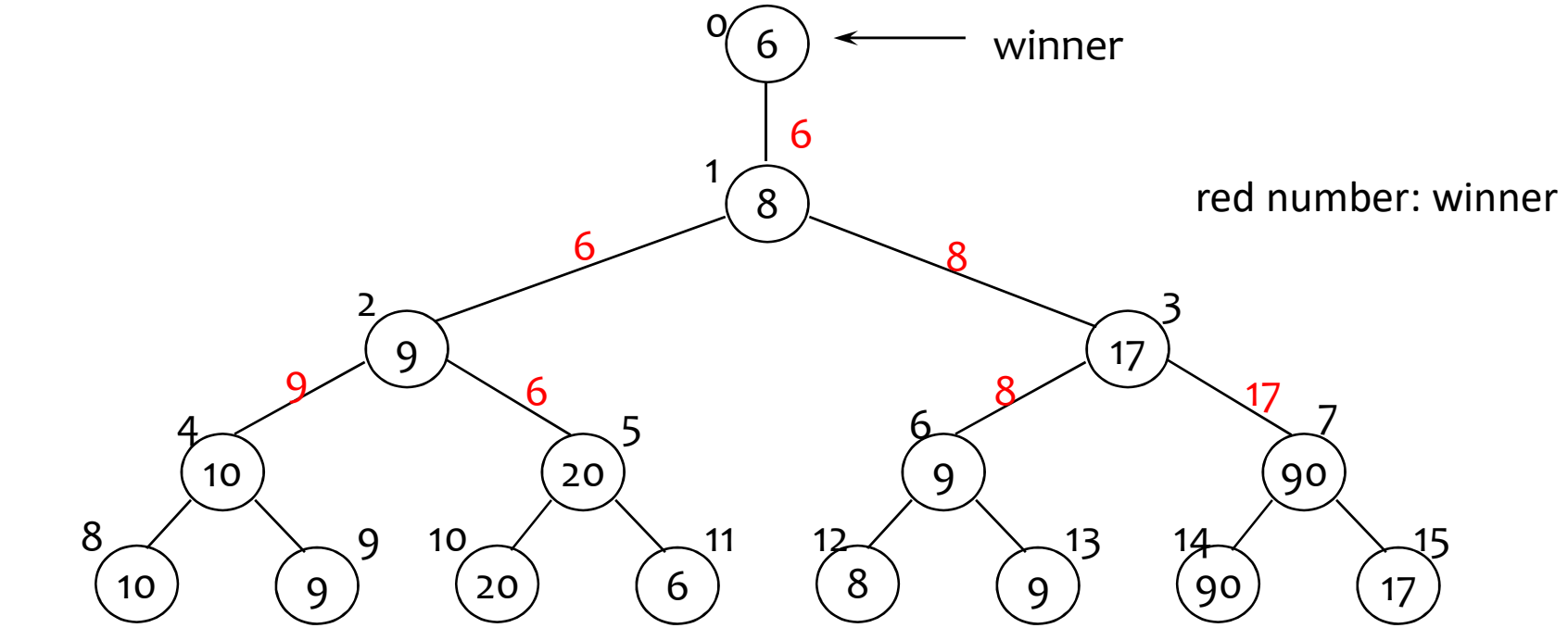
Loser Tree

- Non-leaf is loser, push winner to the top
- No need to compare with siblings



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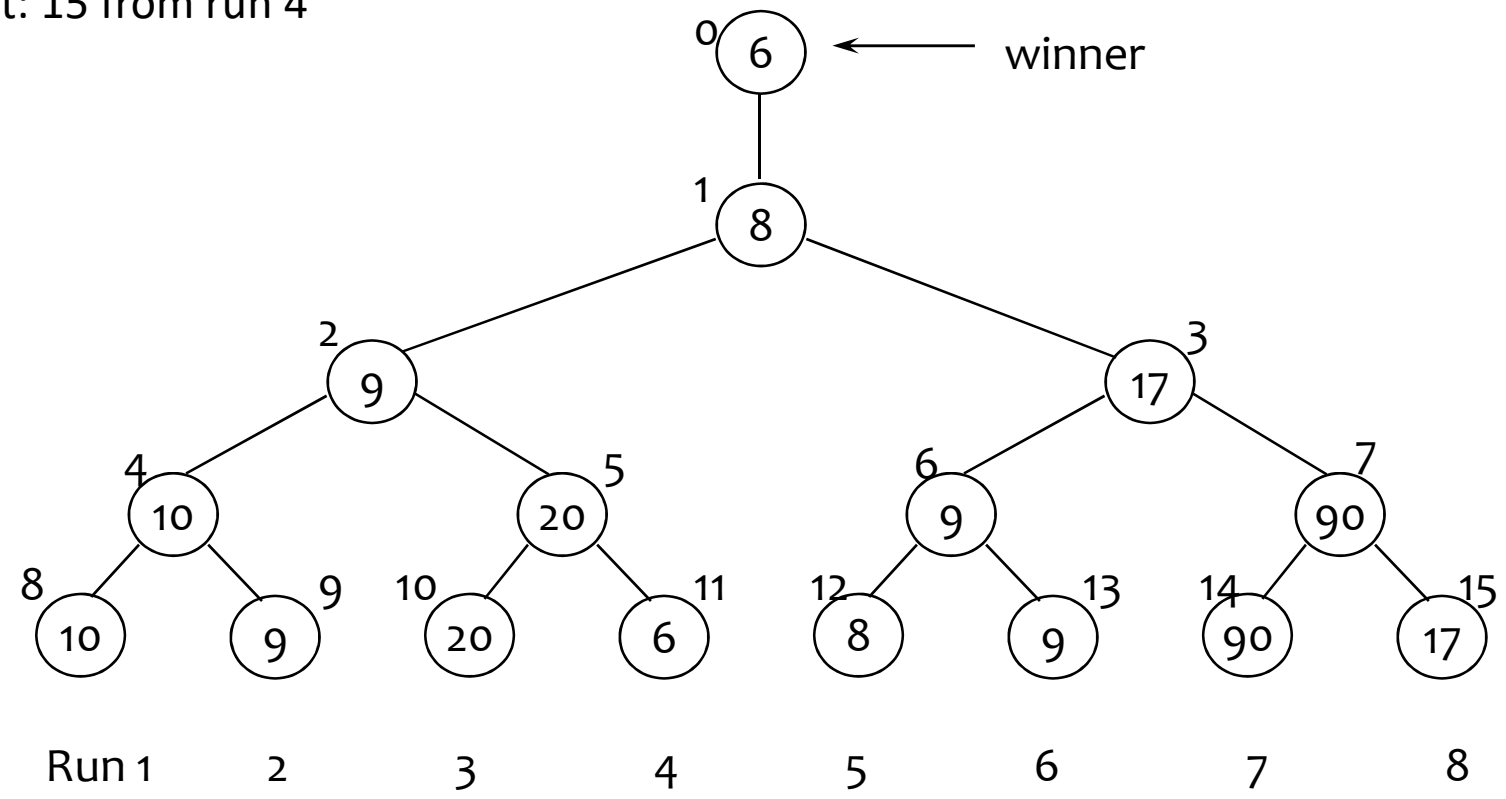
Loser Tree

Next: 15 from run 4



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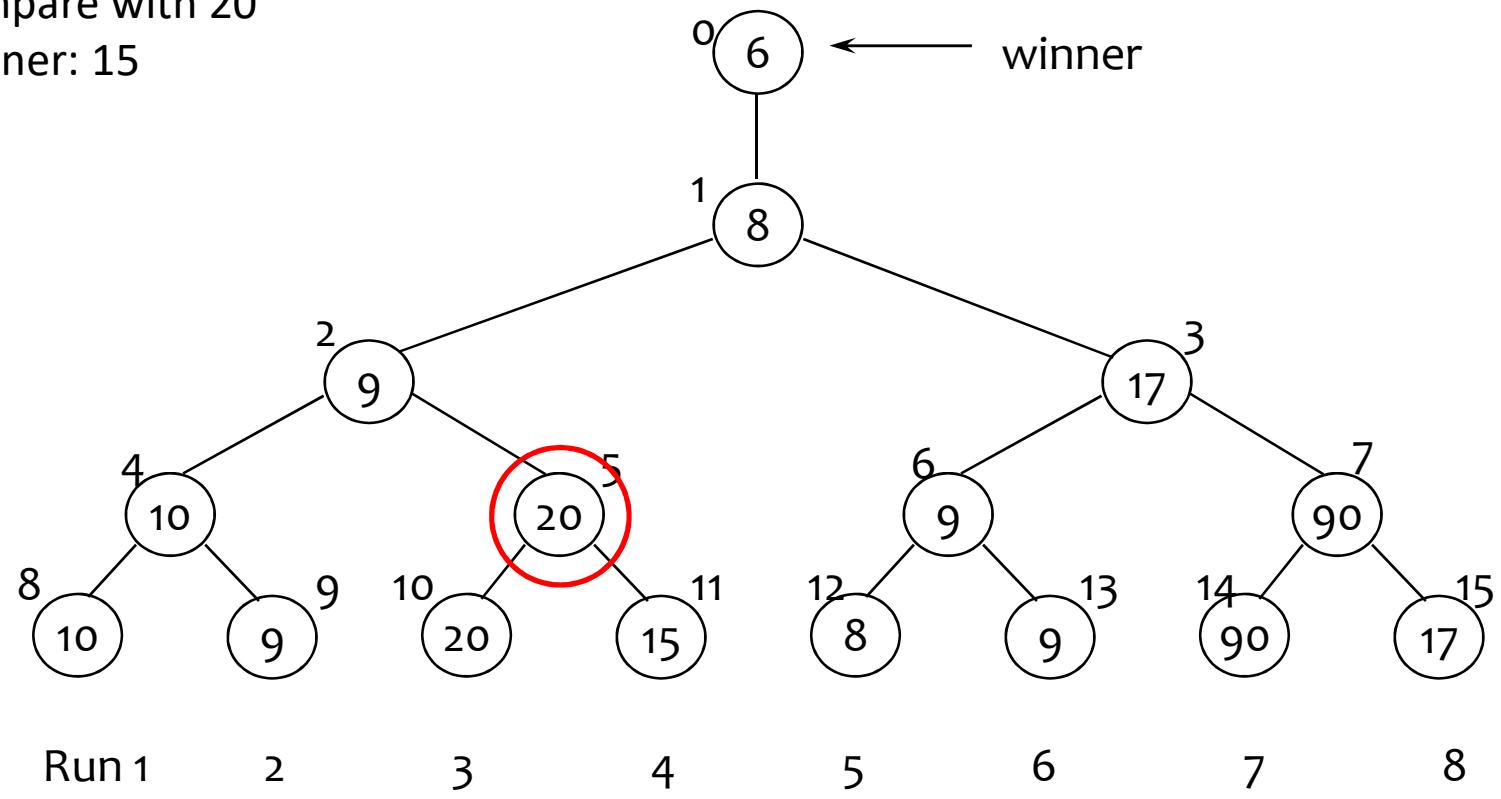
Loser Tree

Compare with 20
Winner: 15



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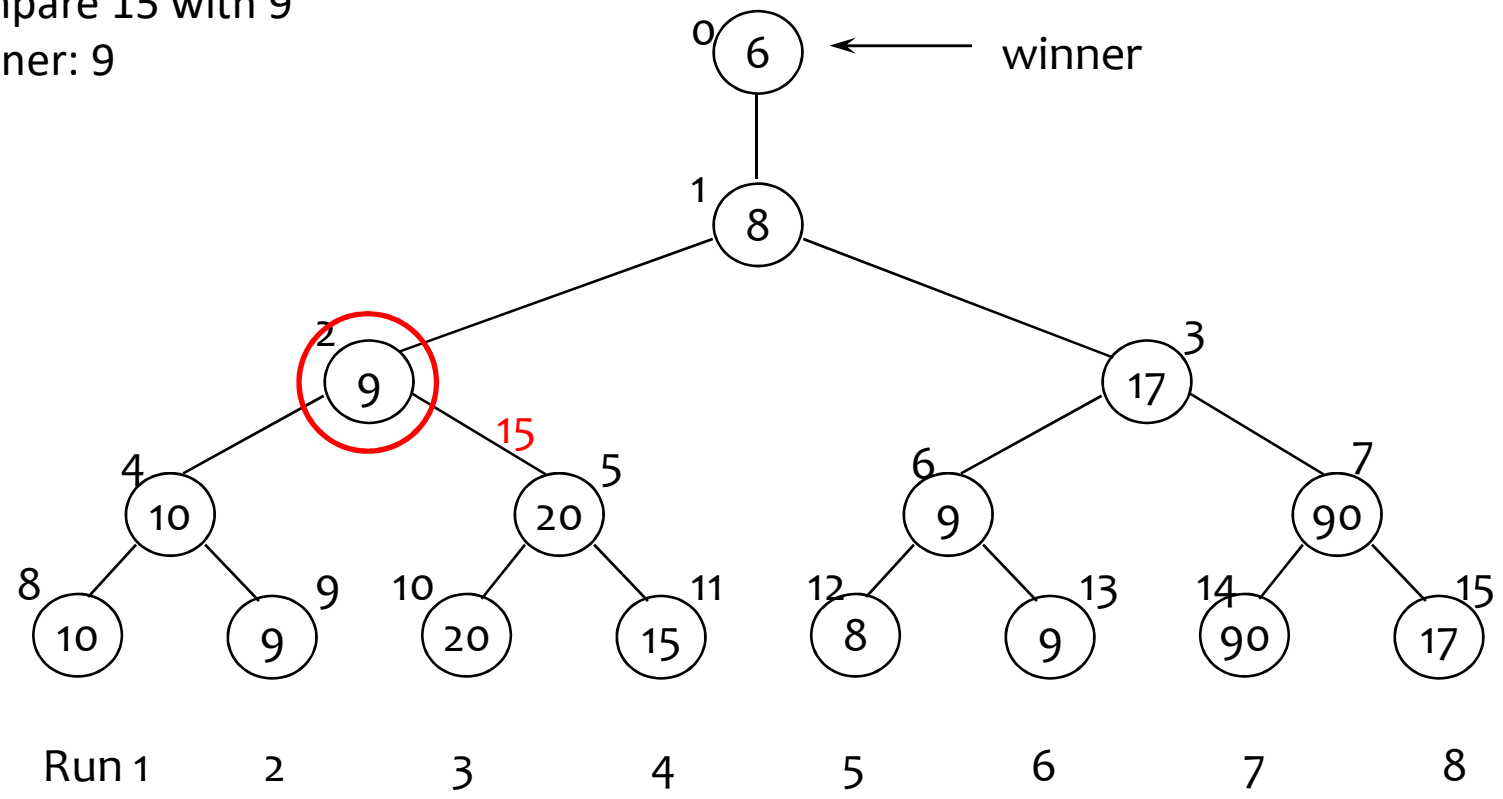
Loser Tree

Compare 15 with 9
Winner: 9



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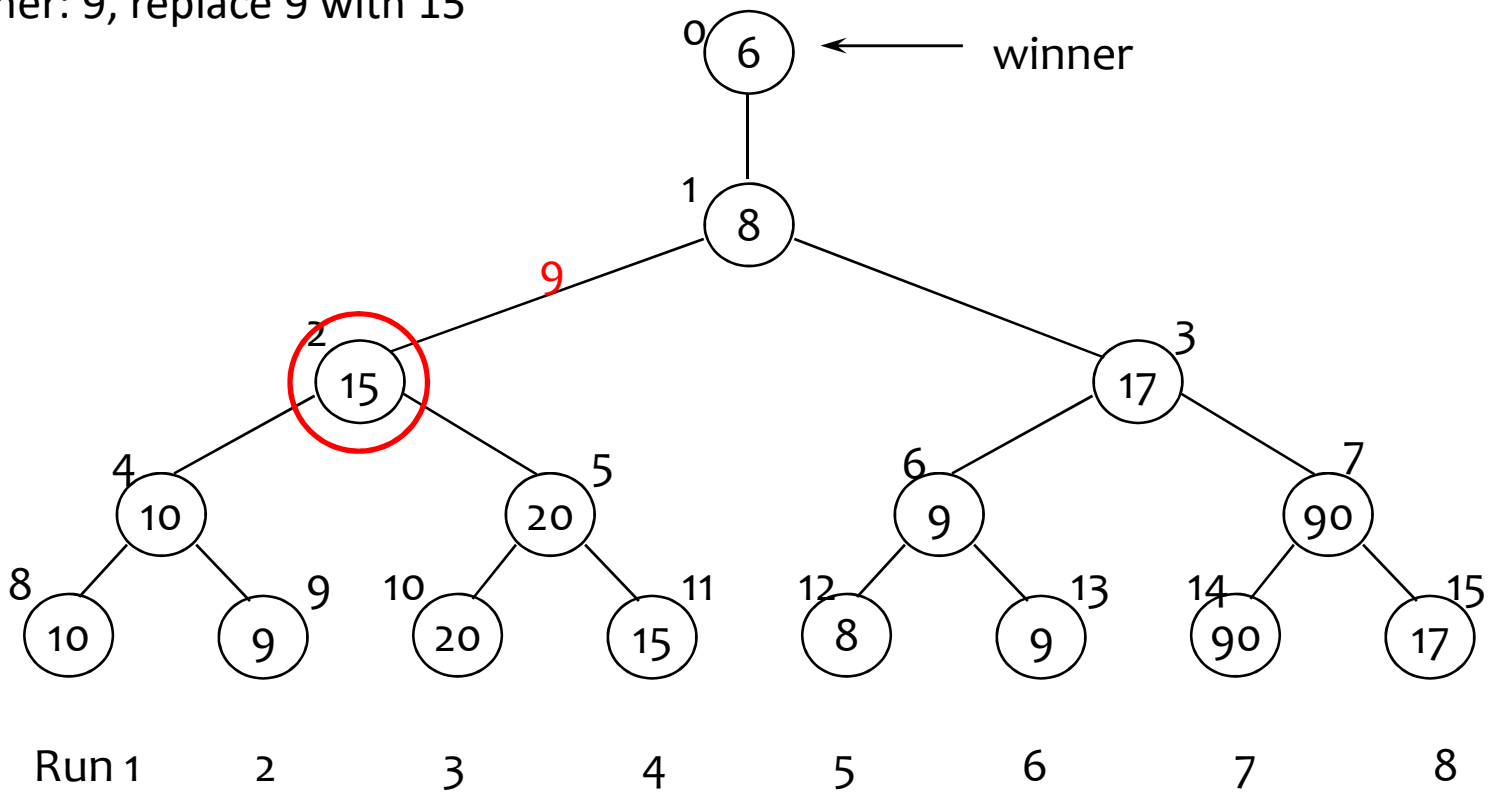
Loser Tree

Winner: 9, replace 9 with 15



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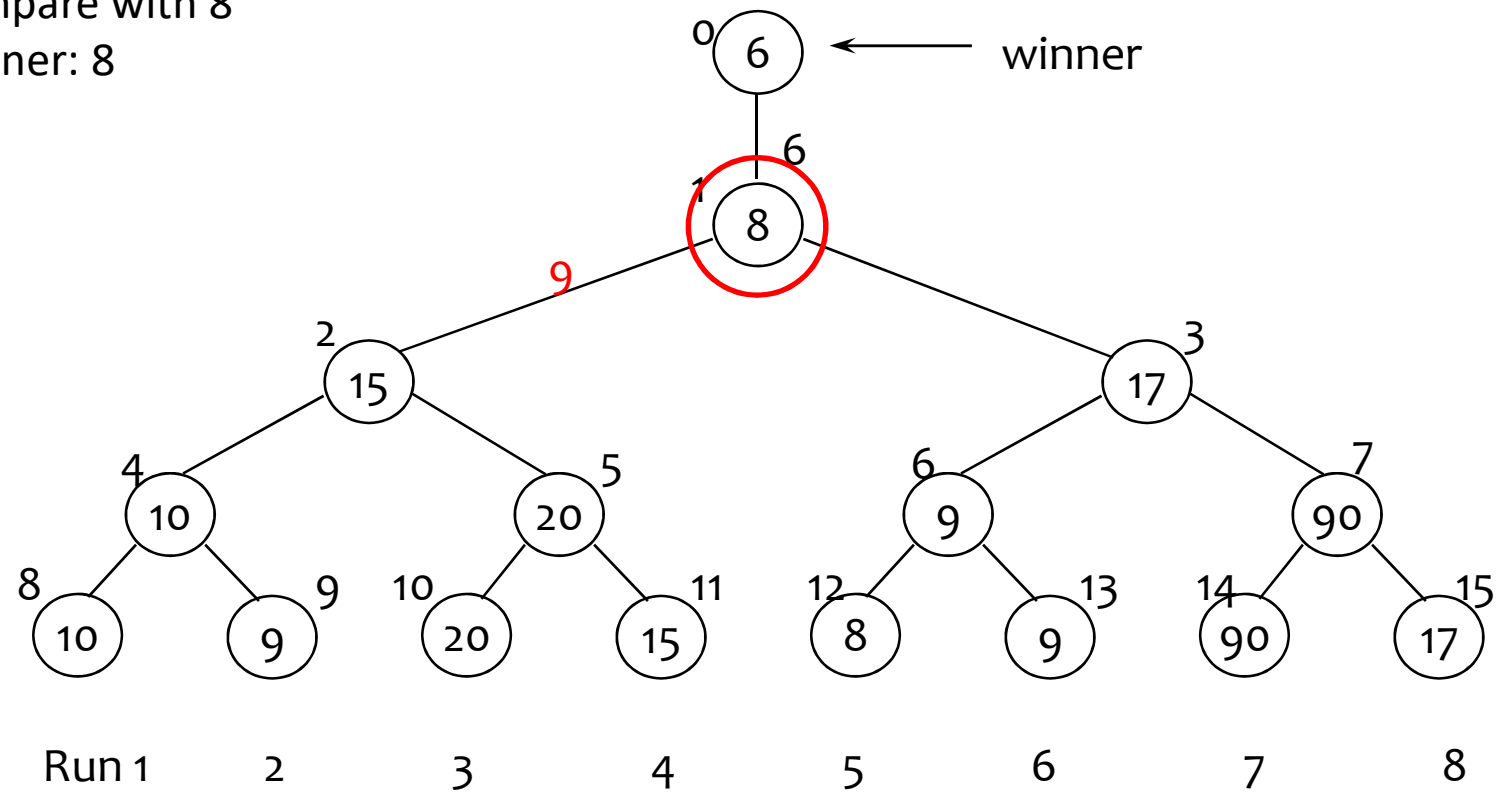
Loser Tree

Compare with 8
Winner: 8



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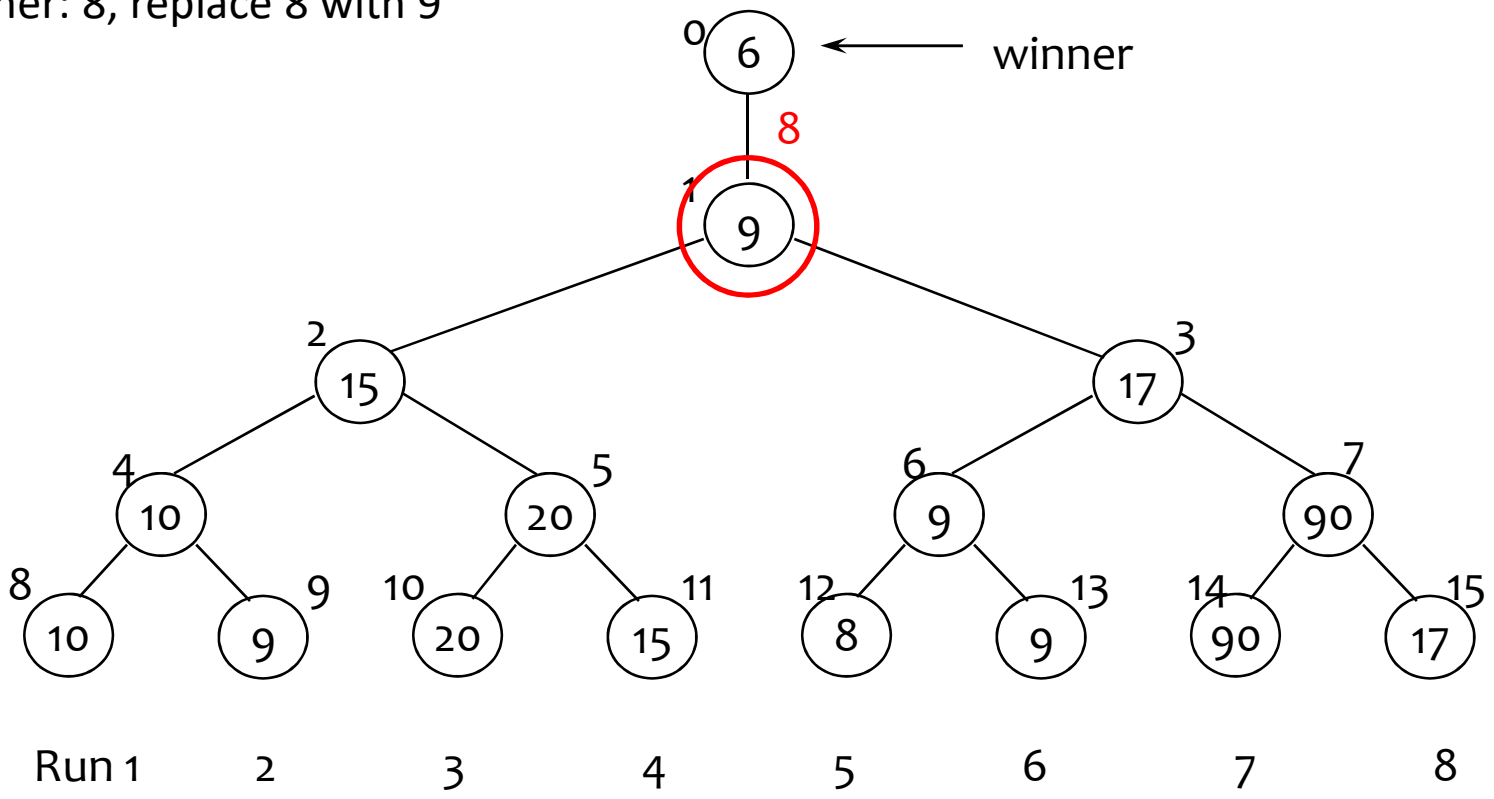
Loser Tree

Winner: 8, replace 8 with 9



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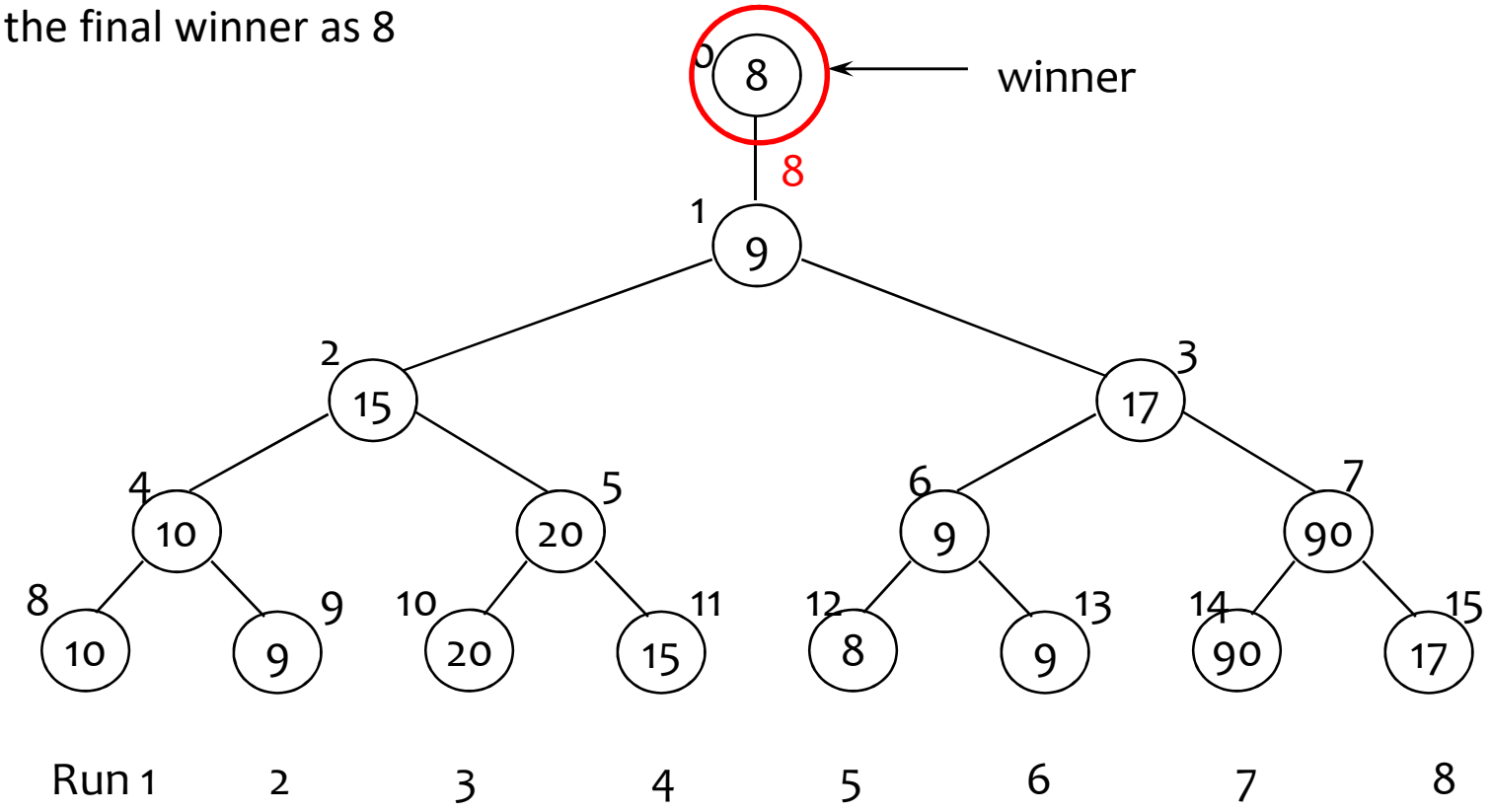
Loser Tree

Set the final winner as 8



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Questions?

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