

# Heap

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## Binary Heap Operations:

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- findmax ( $O(1)$ )
- insert ( $O(\log n)$  (Binary Imp))
  - insert item into next place in the BT
  - Swap item up with parent until heap invariant is maintained
- remove-max ( $O(\log n)$  (Binary Imp))
  - Remove the root (and store it to return)
  - Place the last element inserted at the root
  - Swap item down with child until heap invariant is maintained

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## Applications:

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- heapsort
- graph algorithms
- order stats
- Priority Queue

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## Notes:

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- tree-based structure that satisfies heap property (max heap parent greater than or equal to children)

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## sources:

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- <http://interactivepython.org/runestone/static/pythonds/Trees/BinaryHeapImplementation.html>