6.5-8.

The operation HEAP-DELETE(A, i) deletes the item in node i from heap A. Give an implementation of HEAP-DELETE that runs in $O(\lg n)$ time for an n-element max-heap.

Answer.

The procedure MAX-HEAP-DELETE is similar to HEAP-EXTRACT-MAX procedure.

MAX-HEAP-DELETE(A, i)
1   **if** $A.heap\text{-}size < 1$
2   **error** "heap underflow"
3   $i = A[A.heap\text{-}size]$
4   $A.heap\text{-}size = A.heap\text{-}size - 1$
5   MAX-HEAPIFY(A, i)

The running time of MAX-HEAP-DELETE is $O(\lg n)$, since it performs only a constant amount of work in lines 1–4, while the procedure MAX-HEAPIFY in line 5 takes time $O(\lg n)$.