WST501: Assignment 2 (Due day May 16, 2012)

We have learned an $O(k)$-space structure for maintaining a sample set (without replacement) of size $k$ in a sliding window (obviously, the sliding window must have length at least $k$). In this assignment, you are asked to describe an efficient implementation of the structure to satisfy the following requirements:

- The structure can be updated in $O(1)$ amortized time when a new element arrives in the stream (i.e., the element joins the window, whereas the oldest element in the window expires).

- Whenever we need to return a sample set of size $k$, we should return the sample set in an array of size $k$ in $O(1)$ worst case time. Note that even though the array has $k$ elements, it does not mean that we need $O(k)$ time returning it – it suffices to specify the beginning address of the array!