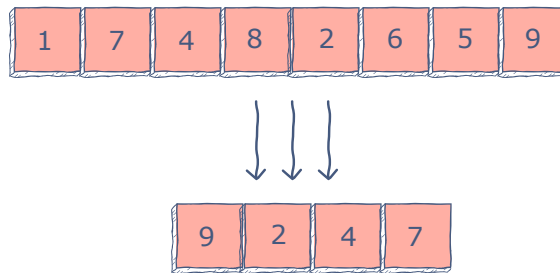




# What is reservoir sampling?

[sampling](#)[algorithms](#)

**Reservoir sampling** is a randomized algorithm that is used to select  $k$  out of  $n$  samples;  $n$  is usually very large or unknown. For example, reservoir sampling can be used to obtain a sample of size  $k$  from a population of people with brown hair. This algorithm takes  $O(n)$  to select  $k$  elements with uniform probability.



Reservoir sampling is used to randomly take  $k$  out of  $n$  samples. Here  $k = 4$ .

## Algorithm

1. Copy the first  $k$  elements from the input array to the output array.
2. Iterate from  $k$  to  $n - 1$  (both inclusive). In each iteration  $j$ :
  - 2.1 Generate a random number  $num$  from 0 to  $j$ .
  - 2.2 If  $num$  is less than  $k$ , replace the element at index  $num$  in the output array with the item at index  $j$  in the input array.

## Code

[C++](#)[Python3](#)[Java](#)



```
// Including dependancies
#include <iostream>
#include <stdlib.h>
#include <time.h>
using namespace std;

int main() {
    // Defining the parameters
    int k = 4;
    int n = 8;
    // The array to be sampled
    int input[] = {1, 7, 4, 8, 2, 6, 5, 9};
    int output[k];
    // Getting a random seed everytime
    srand (time(NULL));
    int i;
    // Initializing the output array to the first k elements
    // of the input array.
    for(i = 0; i < k; i++){
        output[i] = input[i];
    }
    int j;
    // Iterating over k to n-1
    for(j = i; j < n; j++){
        // Generating a random number from 0 to j
        int index = rand() % (j + 1);
        // Replacing an element in the output with an element
        // in the input if the randomly generated number is less
        // than k.
        if(index < k){
            output[index] = input[j];
        }
    }
    cout<<"Input array:"<<endl;
    for( i = 0; i < n; i++){
        cout<<input[i]<<" ";
    }
    cout<<endl;
    cout<<"Output array:"<<endl;
    for(i = 0; i < k; i++){
        cout<<output[i]<<" ";
    }
    cout<<endl;
    return 0;
}
```





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