Ch. 5 Probabilistic Analysis and Randomised Algorithms

5.1 The hiring problem

```
HIRE-ASSISTANT(n)
best = 0
for i = 1 to n
    interview candidate i
    if candidate i is better than best
        best = i
        hire candidate i
```

what is the running time or cost of this algorithm? - $O(n)$

what if the cost of hiring is much greater than the cost of interviewing?

Then the cost is $O(c_h m)$

where m is the number of times a candidate is hired

Examples

Suppose candidates arrive in the order:

3, 1, 2, 7, 6, 4, 5, 9, 8, 10.

where 1 is worst candidate and
10 is best candidate.

The number of hires is 4.

If order is :

2, 4, 6, 8, 10, 1, 3, 5, 7, 9

the number of lines is 5.

Worst case occurs with this order:

1, 2, 3, 4, 5, 6, 7, 8, 9, 10

where number of hires = 10

Best case occurs if 10 is first ; say

10, 7, 3, 1, 2, 8, 9, 4, 5, 6

where number of lines is 1

The input to the algorithm is a list of candidates in some order and the cost is the number of hires.

Different inputs have different costs.

On average, what is the cost/running time of this algorithm?

Note: We assume that the order of candidates is ~~ranked~~ random and that every order or permutation is equally likely to occur.

We refer to this as a uniform random permutation

For the hiring problem it is better to have random inputs to avoid 'bias'.

Thus, it is better to first shuffle the input into random order. using randomly generated values.

An algorithm that depends on randomly generated values or a random number generator is called a randomized algorithm