CS 101 Fall 2020 - Quiz 2-B

10/10/2020 - 20 Minutes **Name:** **ID number:**

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(1) (8 Points) Here is a sorting algorithm in the following. (The array starts at index 1)

```
Procedure Sort(A):
  for i = 1 to A.length - 1:
      for j = A.length downto i + 1:
          if A[j] < A[j - 1]
              key = A[j]
              A[j] = A[j - 1]
              A[j - 1] = key
      // Mark
```

- (3 Points) Which sorting algorithm does it describe?
- (5 Points) Given a list as `[31, 4, 59, 26, 41, 58]`, we use the above procedure to sort it. Write down what will the list be like each time when the procedure meets the `Mark`.

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(2) (7 Points) Suppose that we have a hash table with n slots, with collisions resolved by chaining, and suppose that n keys are inserted into the table. Each key is equally likely to be hashed to each slot. Let M be the maximum number of keys in any slot after all keys have been inserted.

- (3 Points) Calculate the probability Q_k that exactly k keys hash to a particular slot.
- (4 Points) Let P_k be the probability that $M = k$, that is, the probability that the slot containing the most keys contains k keys. Show that $P_k \leq nQ_k$.