COMP1927 15s2 Final Exam

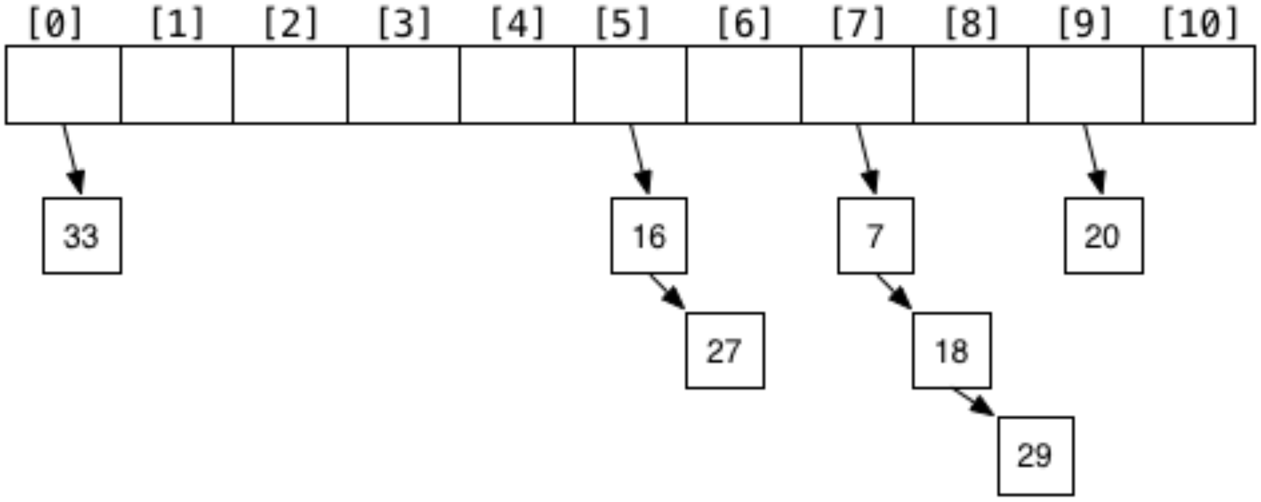
[Instructions] [C language] [Algorithms]
[Q1] [Q2] [Q3] [Q4] [Q5] [Q6] [Q7] **[Q8]** [Q9]

Question 8 (8 marks)

Consider a hash table that uses *chaining* for collision resolution and stores items in the chains in ascending order on key value. The table has 11 slots and uses the following hash function:

```
int hash(int k) { return (k % 11); }
```

As an example, the following diagram shows the state of such a hash table after items containing the keys 7, 16, 18, 20, 27, 29 and 33 are inserted into an initially empty table:



Now consider a scenario where we start with an initially empty table and insert items with key values 1 to 100 (inclusive) into the table.

A. What is the *average* chain length in this table? Show your working. (2 marks)

B. How many items are examined in searching for the key 42? (1 mark)

C. How many items are examined in searching for the key 999? (1 mark)

D. If we continue inserting keys in sequence (101, 102, 103, ...), what is the worst-case search cost after *N* items have been inserted? (Measure search cost in terms of the number of items examined) (1 mark)

E. What is the best-case search cost after *N* items have been inserted? (Measure search cost in terms of the number of items examined) (1 mark)

Now consider starting with an empty hash table once again.

F. Write a C `for`-loop to generate a sequence of key values that would produce a single long chain containing 100 items, if items with these keys were inserted into an initially empty table. (2 marks)

Type the answer to this question into the file called `q8.txt` and submit it using the command:

```
submit q8
```