CSC263: Hash Tables

Question 1

(CLRS 11.2-1) Suppose we use a hash function h to hash n distinct keys into an array T of length m. Assuming simple uniform hashing, what is the expected number of collisions? Assume that hashing a key into a bucket that already has q elements counts as q collisions.

Hint: define a family of indicator random variables $x_{ij}, i < j$ that are 0 when keys i and j do not collide, and 1 when they do collide.

Question 2

The **Multiplication Method** is as follows:

```
h(k) = floor(m * (k*A mod 1))
```

Using `A = (sqrt(5) - 1)/2` and a hash table of size 7, where does key `100` get hashed? Where does key `108` get hashed?

Question 3

Suppose that we use the following quadratic hashing scheme:
`(h(k) + i^2) mod m` for `i=0, 1, 2, ...`

Let $m = 16$, and $h(k) = 10$ for any k. Insert the keys $1, 2, 3, 4, 5$ into an empty hash table. What happens?