CS235 HW3 (12 pts)

Please submit the file with the answers to problems 1,3,4 as HW3\_134.pdf. For problem 2 submit the code: HW3\_2.py and output (screenshot of testing): HW3\_2.jpg/png.

1. (3 pts) Consider the hashing function *h*(*k*) = *k* **mod** m acting on year numbers ranging from to 1920 to 2016. What is the condition on m (size of the hash table), to ensure each of the following requirements:
   1. there are no collisions
   2. the hash table is full
   3. h is a bijection
2. (4 pts) Define functions checkUPC and checkISBN10, which check UPC and ISBN digits for validity. Test them on the following digits:
   1. UPC: 030331021641; 041331021641
   2. ISBN10: n=074930149X (X=10); n with an error in 1 digit; n with swapped digits
3. (2 pts) Prove that the formula for checking the validity of ISBN-10 follows from the formula for the check digit (see slide 7, Lecture 3).

Hint: use the fact: *a* ≡ *b* (mod m) → s+*a*  ≡ s+*b*  (mod m).

1. (3 pts) Would the single and transposition errors (see slide 9 of Lecture 3) be always detected if validity of ISBN-10 is tested using the following formula. Justify your answer.

Hint: look at the proof at slide 10 of Lecture 3.