Task 7

1. **Types of Hash Functions:**
   - **Division Method:**
   - **The division method involves dividing the key by a prime number and using the remainder as the hash value.**
     h(k)=k mod m
     Where k is the key and m***m is a prime number.***
   - **Advantages:**
     Simple to implement.
     Works well when mm **is a prime number.**
   - **Disadvantages:**
     Poor distribution if mm **is not chosen wisely.**

   - **Cryptographic Hash Functions:**
   - **Cryptographic hash functions are designed to be secure and are used in cryptography. Examples include MD5, SHA-1, and SHA-256.**
   - **Characteristics:**
     Pre-image resistance.
     Second pre-image resistance.
     Collision resistance.
   - **Advantages:**
     High security.
   - **Disadvantages:**
     Computationally intensive.

- Folding Method:
- The folding method involves dividing the key into equal parts, summing the parts, and then taking the modulo with respect to mm.
- Steps:
  Divide the key into parts.
  Sum the parts.
  Take the modulo mm of the sum.
- Advantages:
  Simple and easy to implement.
- Disadvantages:
  Depends on the choice of partitioning scheme.

- Mid-Square Method
- In the mid-square method, the key is squared, and the middle digits of the result are taken as the hash value.
- Steps:
  Square the key.
  Extract the middle digits of the squared value.
- Advantages:
  Produces a good distribution of hash values.
- Disadvantages:
  May require more computational effort.

- Multiplication Method
- In the multiplication method, a constant AA (0 < A < 1) is used to multiply the key. The fractional part of the product is then multiplied by mm to get the hash value.
  $h(k)=\lfloor m(kAmod1)\rfloor$
  Where ⌊ ⌋ denotes the floor function.
- Advantages:
  Less sensitive to the choice of mm.
- Disadvantages:
  More complex than the division method.

2. Reading the first line in a file:
   - file.seek(0) will go the start of the file

3. Set is built on a hash table