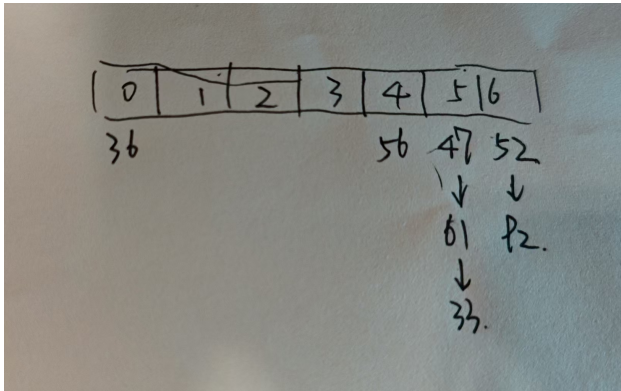Name: LessTanker

Collaborators: ChatGPT, Name2

Problem 3-1.

(a) The picture is as follows:

(b) 13: Calculate from the smallest prime p with $p > 10$,11 is not ok, then 13 does.

Problem 3-2.

(a)
$$k_1 = k_2 + t \cdot n(t \in \mathbb{N})$$

(b) Choose k_1 and k_2 to be adjacent so that

$$|\frac{k_1 n}{u}| = |\frac{k_2 n}{u}|$$

(c) We can't guarantee that they will be roommates because in a universal hash family, the probability of two keys collide is at most $\frac{1}{n}$.

Problem 3-3.

(a) Using radix sort to make this $O(n)$

(b) radix sort again?

(c) IF n is a constant, then use radix sort by multipling n^3

(d) Merge sort this time because we need to compare.

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Problem 3-4.

(a) hash

(b) Radix sort first, then use two pointers, the first one marks the head, the other one marks the tail. If the total of two pointers is bigger than r, then move tail pointer one step back. Otherwise, move head pointer one step forward till find the closest one.

Problem 3-5.

(a)

(b)

(c) Submit your implementation to alg.mit.edu.