

# Hashing

**3/3 points (100%)**

Practice Quiz, 3 questions

1 / 1  
points

1.

What is the minimum size of an array that can be used in the direct addressing scheme to store a map from 7-digit phone numbers to names?



10000000

**Correct**

Correct! 7-digit phone numbers correspond to integers from 0 to 9999999.



20000000



1000000

1 / 1  
points

2.

If it is guaranteed that the total length of all occurrences of a *Pattern* in a *Text* is at most  $L$ , which of the below estimates of the average running time of Rabin-Karp's algorithm to find all occurrences of the *Pattern* in the *Text* is the most tight out of the correct ones?

 $O(|Text||Pattern|L)$  $O(|Text| + |Pattern|)$  $O(|Text||Pattern| + L)$  $O(|Text| + |Pattern| + L)$ **Correct**

Correct! Estimate from the lecture is

$O(|Text| + (q + 1)|Pattern|)$ , where  $q$  is the number of occurrences of the *Pattern* in the *Text*, and  $L = q|Pattern|$

in this case.

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3.

Let us slightly change the polynomial hash function for strings and set

$$h(S) = \left( \sum_{j=0}^{|S|-1} x^{|S|-1-j} S[j] \right) \bmod p.$$

Let us fix some *Text* and some

*Pattern*. Denote by  $H[i]$  the hash function of the substring  $Text[i..i + |Pattern| - 1]$  of the *Text* starting from position  $i$  and having the same length as *Pattern* (for all appropriate positions  $i$  where the *Pattern* can occur in the *Text*). Which of the below formulas is the correct recurrence to compute  $H[i + 1]$  given  $H[i]$ ?

- ☐  $H[i] = (xH[i + 1] + Text[i] - x^{|Pattern|}Text[i + |Pattern|]) \bmod p$
- ☐  $H[i + 1] = (xH[i] + Text[i + |Pattern| - 1] - x^{|Pattern|}Text[i]) \bmod p$
- ☒  $H[i + 1] = (xH[i] + Text[i + |Pattern|] - x^{|Pattern|}Text[i]) \bmod p$

**Correct**

Correct! When we move one position to the right from position  $i$ , each term must increase the power of  $x$  in it by one, the first term  $x^{|Pattern|}Text[i]$  must be subtracted after that, and a new term  $Text[i + |Pattern|]$  must be added.

- ☐  $H[i + 1] = (xH[i] + x^{|Pattern|}Text[i + |Pattern|] - Text[i]) \bmod p$

