

zadatok 1

$$m = 19$$

$$k_j = 77, 69, 39, 70, 6, 8, 40, 89, 49, 15$$

a)  $h(k) = k \bmod m$

Určujeme hodnoty  $h(k)$  i 19 až do  $m$

$$h(77) = 77 \bmod 19 = 1$$

$$h(69) = 69 \bmod 19 = 12$$

$$h(39) = 39 \bmod 19 = 1$$

$$h(70) = 70 \bmod 19 = 13$$

$$h(6) = 6 \bmod 19 = 6$$

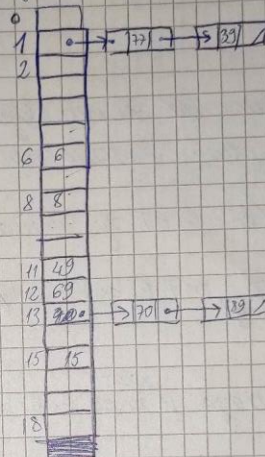
$$h(8) = 8 \bmod 19 = 8$$

$$h(40) = 40 \bmod 19 = 2$$

$$h(89) = 89 \bmod 19 = 13$$

$$h(49) = 49 \bmod 19 = 11$$

$$h(15) = 15 \bmod 19 = 15$$



b)  $h(k, i) = [h_1(k) + i \cdot h_2(k)] \bmod m$ ,  $i = 0, 1, 2, \dots, m-1$

$$h_1(k) = k \bmod m, m = 19$$

$$h_2(k) = 1 + k \bmod (m-1)$$

k	$h_1$	$h_2$	$i=0$	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
77	1	6	1	77	40																
69	12	16	12																		
39	1	4	1																		
70	13	17	13																		
6	6	7	6																		
8	8	8	8																		
40	2	5	2																		
89	13	18	13																		
49	11	14	11																		
15	15	16	15																		

kolize:

$$h(39) \text{ za } i=1 = (5)$$

$$h(89) \text{ za } i=1 \Rightarrow (13+18) \bmod 19 = 12$$

$$h(89) \text{ za } i=2 \Rightarrow (13+36) \bmod 19 = 11$$

$$h(49) \text{ za } i=1 \Rightarrow 6$$

$$i=2 \Rightarrow (11+28) \bmod 19 = 1$$

$$i=3 \Rightarrow (11+42) \bmod 19 = 1$$

$$h(15) \text{ za } i=1 = 12$$

1.2.  $n$ -znam. br.  $x_1, x_2, \dots, x_n$ ,  $x_i \in \{0, \dots, 9\}$

$$f(x) = \sum_{i=1}^n a_i x_i \pmod{8}$$

je univerzální pro 2a upr.  $a_1$  i  $a_2 = 1$  i 14 i 28 49

$$1 \cdot 1 + 4 \cdot 1 = 5 \bmod 8 = 5$$

$$2 \cdot 1 + 2 \cdot 1 = 4 \bmod 8 = 4$$

2. zad

Uzmemo da su naši blyučci poredani po veličini  
 $\{k_1, \dots, k_n\}$ . Nađemo neki  $\ell > k_i, i=1, \dots, n$  takav da  
je  $h(k_i) = h(\ell)$  tj. računamo sumu

$$\sum_{x > q_i} \Pr \{ h(k_x) = h(k_i) \} = \sum_{x > i} \frac{1}{n} = \frac{n-i}{n}$$

Broj kolizija je <sup>kolik</sup> suma svih kolizija od 1 do n-og el.

$$\sum_{i=1}^n \frac{n-i}{n} = n^2 - \left( \frac{n(n+1)}{n} \right) = \frac{n^2 - n}{n}$$