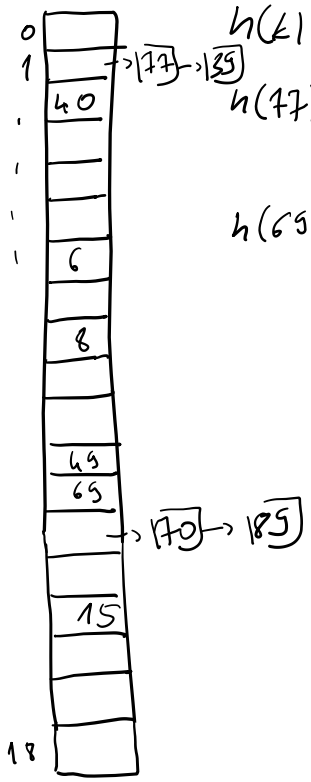
Zad 1.

77 69 39 70 6 8 40 85 49 15

1.a)



$h(k) = k \bmod n$, $n = 19$

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

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

$h(39) = 1$

$h(70) = 13$

$h(6) = 6$

$h(8) = 8$

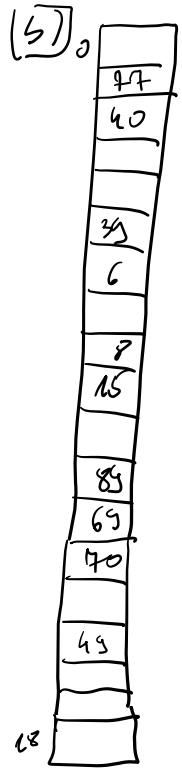
$h(40) = 2$

$h(85) = 13$

$h(49) = 11$

$h(15) = 15$

1.b)



$h(k,i) = (h_1(k) + i * h_2(k)) \bmod n$

$h_1(k) = k \bmod n$ → tak pod a)

$h_2(k) = 1 + (k \bmod (n-1)) = 1 + (k \bmod 18)$

$h_2(77) = 6$
$h_2(69) = 16$
$h_2(39) = 4$
$h_2(70) = 17$
$h_2(6) = 7$
$h_2(8) = 9$
$h_2(40) = 5$
$h_2(85) = 18$
$h_2(49) = 14$
$h_2(15) = 16$

$h(77,0) = 1$
$h(69,0) = 12$
$h(39,0) = 1$ ✗ kolizja
$h(39,1) = 5$
$h(70,0) = 13$
$h(6,0) = 6$
$h(8,0) = 8$
$h(40,0) = 2$

$h(85,0) = 13$ ✗
$h(85,1) = 12$ ✗
$h(85,2) = 11$
$h(49,0) = 11$ ✗
$h(49,1) = 6$ ✗
$h(49,2) = 1$ ✗
$h(49,3) = 15$
$h(15,0) = 15$ ✗
$h(15,1) = 12$ ✗
$h(15,2) = 5$

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

np. dla $n = 4$, $a_1 = a_2 = a_3 = a_4$ i dla np. 4032 i 5408 mamy

$4 \cdot 1 + 0 \cdot 1 + 3 \cdot 1 + 2 \cdot 1 = 9 \bmod 8 = 1$

$5 \cdot 1 + 4 \cdot 1 + 0 \cdot 1 + 8 \cdot 1 = 17 \bmod 8 = 1$

⇒ funkcja nie uniwersalna

Zad 2.

$X \to$ slučajna varijabla koja modelira vjerojatnost dobitka za 1 kuglicu

$$X \sim \begin{pmatrix} 0 & 1 & 2 & \cdots & n-1 \\ 0 & \frac{1}{n} & \frac{1}{n} & \cdots & \frac{1}{n} \end{pmatrix}$$

očekivanje:

$$EX = \sum_{i=0}^{n-1} \frac{i}{n} = \frac{1}{n} \sum_{i=0}^{n-1} i = \frac{1}{n} \cdot \frac{n(n-1)}{2} = \frac{n(n-1)}{2n}$$