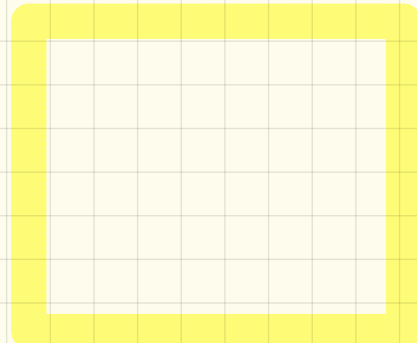


Composition method

X Y $0 < \alpha < 1$

$$Z = \begin{cases} X & \alpha \\ Y & 1-\alpha \end{cases}$$

$$P_Z = \alpha P_X + (1-\alpha) P_Y$$



$$I = \begin{cases} 1, 2, 3, 4 & \frac{1}{1} \\ \Delta & \frac{1}{1} + \frac{1}{4} \\ 9, V & \frac{1}{4} \end{cases}$$

$$\left. \begin{array}{l} X = \text{unit} \{1, -, \Delta\} \\ Y = \text{unit} \{\Delta, 9, V\} \end{array} \right\} \Rightarrow I = \begin{cases} X & \frac{1}{2} \\ Y & \frac{1}{2} \end{cases}$$

Alias Method

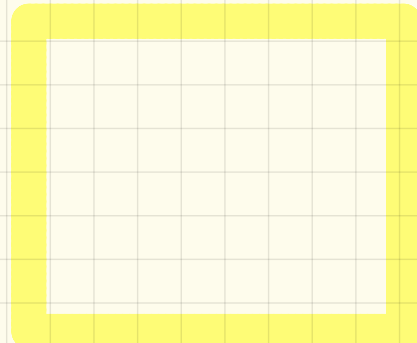
$X \rightarrow n$ مقادیر $\rightarrow P$ تابع احتمال X

$1, \dots, n$

P_1, \dots, P_n

$$P = \frac{1}{n-1} \sum_{i=1}^{n-1} Q^{(i)}$$

$Q^{(i)}$ مقادیر binary جستجو



$$E_x. n=4$$

$$P: \quad P_1 = \frac{7}{16} \quad P_2 = \frac{1}{4} \quad P_3 = \frac{1}{8} \quad P_4 = \frac{3}{16}$$

$$n-1 = 3$$

$$P = \frac{1}{3} (Q_1 + Q_2 + Q_3)$$

درگاه اول با مقدار شروع می کنیم که احتمال آن کمتر از $\frac{1}{n-1}$ باشد (بدون خواه)

$$i=3 \rightarrow Q_1 = \begin{cases} 3 & \alpha_1 = 3/8 \quad \Leftarrow \alpha_1 \times 1/3 = 1/8 \\ 1 & 1 - \alpha_1 = 5/8 \end{cases}$$

مقدار دوم Q_2 باید به گونه ای باشد که جمع احتمال آن و احتمال $\frac{1}{n-1}$ شروع

$$P: \quad P_1 = \frac{7}{16} \quad P_2 = \frac{1}{4} \quad P_3 = \frac{1}{8} \quad P_4 = \frac{3}{16}$$

$$P = \frac{1}{3} (Q_1 + Q_2 + Q_3) \quad Q_1 = \begin{cases} 3 & \frac{3}{8} \\ 1 & \frac{5}{8} \end{cases}$$

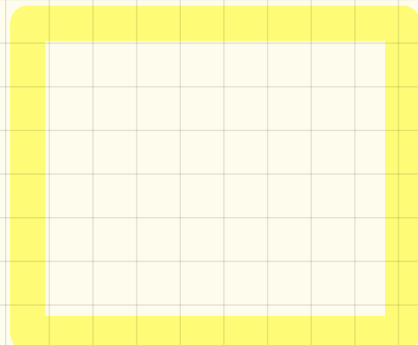
$$\left. \begin{aligned} P &= \frac{7}{16} \delta_1 + \frac{1}{4} \delta_2 + \frac{1}{8} \delta_3 + \frac{3}{16} \delta_4 \\ Q_1 &= \frac{3}{8} \delta_3 + \frac{5}{8} \delta_1 \end{aligned} \right\} \Rightarrow P - \frac{1}{3} Q_1 = \frac{3 \times 7 - 2 \times 5}{48} \delta_1 + \frac{1}{4} \delta_2 + \frac{3}{16} \delta_4$$

$$\frac{11}{48} \delta_1 + \frac{1}{4} \delta_2 + \frac{3}{16} \delta_4 = \frac{1}{3} (Q_2 + Q_3)$$

$$Q_2 = \begin{cases} 2 \\ 4 \end{cases}$$

$$\alpha_2 = \frac{3}{4} \quad \Leftarrow \frac{1}{4} = \frac{1}{3} \times \alpha_2$$

$$1 - \alpha_2 = \frac{1}{4}$$



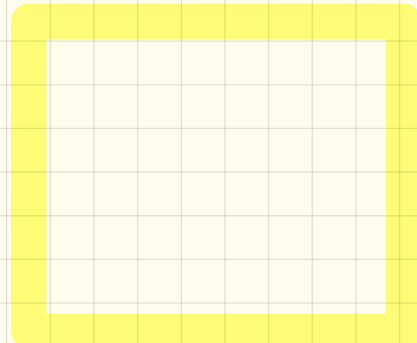
$$\frac{11}{48} \delta_1 + \frac{1}{4} \delta_2 + \frac{3}{16} \delta_3 = \frac{1}{3} (Q_2 + Q_3)$$

$$Q_2 = \begin{cases} 2 \\ 4 \end{cases} \quad \alpha_2 = \frac{3}{4} \quad \Leftarrow \frac{1}{4} = \frac{1}{3} \times \alpha_2$$

$$1 - \alpha_2 = \frac{1}{4}$$

$$\frac{11}{48} \delta_1 + \frac{1}{4} \delta_2 + \frac{3}{16} \delta_4 = \frac{1}{3} \left(\frac{3}{4} \delta_2 + \frac{1}{4} \delta_4 + Q_3 \right)$$

$$\frac{11}{48} \delta_1 + \frac{9-4}{48} \delta_4 = \frac{1}{3} Q_3 \Rightarrow Q_3 = \frac{11}{16} \delta_1 + \frac{5}{16} \delta_4$$



تمرین Alias method: حالتی آن را بنویسید.

