$$\xi \sim \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ \frac{1}{6} & \frac{1}{6} & \frac{1}{6} & \frac{1}{6} & \frac{1}{6} & \frac{1}{6} \end{pmatrix}$$

$$\xi_2 \sim \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ \frac{1}{6} & \frac{1}{6} & \frac{1}{6} & \frac{1}{6} & \frac{1}{6} & \frac{1}{6} \end{pmatrix}$$

$$\xi + \xi_2 = \eta \sim \begin{pmatrix} 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 & 11 & 12 \\ \frac{1}{36} & \frac{2}{36} & \frac{3}{36} & \frac{4}{36} & \frac{5}{36} & \frac{6}{36} & \frac{5}{36} & \frac{4}{36} & \frac{3}{36} & \frac{2}{36} & \frac{1}{36} \end{pmatrix}$$

$(1,\ 12)$

$\forall\ k = 2,\ \dots,\ 7$

$$p\left(\eta = k\right) =$$

$$p\left(\xi + \xi_2 = k\right) = p\left(\bigcup_{t=1}^{k-1} \{(\xi,\ \xi_2) : \xi = t,\ \xi_2 = k - t - 1\}\right) = \sum_{t=1}^{k-1} p\left(\xi = t,\ \xi_2 = k - t - 1\right) =$$

$$\sum_{t=1}^{k-1} p\left(\xi = t\right) p\left(\xi_2 = k - t - 1\right) = \sum_{t=1}^{k-1} p\left(\xi = t\right) p\left(\xi_2 = k - t - 1\right) = \left(k - 1\right) \frac{1}{6} * \frac{1}{6} = \frac{\left(k - 1\right)}{36},$$

$\forall\ k = 8,\ \dots,\ 12$

$$p\left(\eta = k\right) = p\left(\xi + \xi_2 = k\right) = p\left(\bigcup_{t=k-6}^{6} \{(\xi,\ \xi_2) : \xi = t,\ \xi_2 = k - t\}\right) =$$

$$\sum_{t=k-6}^{6} p\left(\xi = t,\ \xi_2 = k - t - 1\right) = \sum_{t=k-6}^{6} p\left(\xi = t\right) p\left(\xi_2 = k - t - 1\right) =$$

$$\sum_{t=k-6}^{6} p\left(\xi = t\right) p\left(\xi_2 = k - t - 1\right) = \left(12 - k + 1\right) \frac{1}{6} * \frac{1}{6} = \frac{\left(13 - k\right)}{36},$$

$\forall\ k = 2,\ \dots,\ 7;\ n = 1,\ \dots,\ 6$

$$p\left(\eta = k \mid \xi = n\right) =$$

$$\frac{p\left(\xi + \xi_2 = k,\ \xi = n\right)}{p\ (\xi = n)} = \frac{p\left(\xi_2 = k - n,\ \xi = n\right)}{p\ (\xi = n)} = \frac{p\left(\xi_2 = k - n\right) * p\ (\xi = n)}{p\ (\xi = n)} = p\left(\xi_2 = k - n\right) = \frac{1}{6}$$

$\forall\ k = 8,\ \dots,\ 12;\ n = k - 6,\ \dots,\ 6$

$$p\left(\eta = k \mid \xi = n\right) =$$

$$\frac{p\left(\xi + \xi_2 = k,\ \xi = n\right)}{p\ (\xi = n)} = \frac{p\left(\xi_2 = k - n,\ \xi = n\right)}{p\ (\xi = n)} = \frac{p\left(\xi_2 = k - n\right) * p\ (\xi = n)}{p\ (\xi = n)} = p\left(\xi_2 = k - n\right) = \frac{1}{6}$$

$\forall\ k = 8,\ \dots,\ 12;\ n = 1,\ \dots,\ k - 6 - 1$

$$p\left(\eta = k \mid \xi = n\right) = \frac{p\left(\xi + \xi_2 = k,\ \xi = n\right)}{p\ (\xi = n)} =$$

$$\frac{p\left(\xi_2 = k - n,\ \xi = n\right)}{p\ (\xi = n)} = \frac{p\left(\xi_2 = k - n\right) * p\ (\xi = n)}{p\ (\xi = n)} = p\left(\xi_2 = k - n\right) = 0, \text{ т.к. } k - n > 6$$

Уберём из рассмотрения невосместные события

$$I(n,\ k) = I(\xi = n;\ \eta = k) =$$

$$\log \frac{p(\eta = k \mid \xi = n)}{p(\eta = k)} = \begin{cases} \log \frac{1/6}{\frac{(k-1)}{36}}, & k = 2,\ \ldots,\ 7,\quad n = 1,\ \ldots,\ 6 \\ \log \frac{1/6}{\frac{(13-k)}{36}}, & k = 8,\ \ldots,\ 12,\ n = k-6,\ \ldots,\ 6 \end{cases} =$$

$$\begin{cases} \log 6 - \log(k-1), & k = 2,\ \ldots,\ 7,\quad n = 1,\ \ldots,\ 6 \\ \log 6 - \log(13-k), & k = 8,\ \ldots,\ 12,\quad n = k-6,\ \ldots,\ 6 \end{cases}$$

$$I_{\xi;\eta} \sim$$

$$\begin{pmatrix} I(1;\ 2) & I(1;\ 3) & \ldots & I(6;\ 12) \\ p(\xi = 1) * p(\eta = 2 \mid \xi = 1) & p(\xi = 1) * p(\eta = 3 \mid \xi = 1) & \ldots & p(\xi = 6) * p(\eta = 12 \mid \xi = 6) \end{pmatrix}$$

$$I(\xi;\ \eta) =$$

$$E\left[I_{\xi;\eta}\right] =$$

$$\sum_{j=1}^{7}\sum_{i=1}^{6} I(i,\ j) * p(\xi = i) * p(\eta = j \mid \xi = i) + \sum_{j=8}^{12}\sum_{i=j-6}^{6} I(i,\ j) * p(\xi = i) * p(\eta = j \mid \xi = i) =$$

$$\sum_{j=1}^{7}\sum_{i=1}^{6}\left(\log 6 - \log(j-1)\right) * \frac{1}{6} * \frac{1}{6} + \sum_{j=8}^{12}\sum_{i=j-6}^{6}\left(\log 6 - \log(13-j)\right) * \frac{1}{6} * \frac{1}{6} =$$

$$\log 6 - \frac{1}{36}\sum_{j=2}^{7} 6 * \log(j-1) + \frac{1}{36}\sum_{j=8}^{12}\left((13-j) * \left(\log 6 - \log(13-j)\right)\right) =$$

$$\log 6 - \frac{1}{6}\log(6!) + \frac{5}{36} * \log 6 \sum_{j=8}^{12}(13-j) - \frac{1}{36}\sum_{j=8}^{12}(13-j)\log(13-j) =$$

$$\log 6 - \frac{1}{6}\log(720) + \frac{25}{12} * \log 6 - \frac{1}{36}\sum_{j=8}^{12}(13-j)\log(13-j) =$$

$$\frac{37}{12} * \log 6 - \frac{1}{6}\log(720) - \frac{1}{36}\left(\log\left(5^5 * 4^4 * 3^3 * 2^2\right)\right) =$$

$$\frac{37}{12} * \log 6 - \frac{1}{6}\log(720) - \frac{1}{36}\left(\log\left(\frac{5!}{0!}\right) + \log\left(\frac{5!}{1!}\right) + \log\left(\frac{5!}{2!}\right) + \log\left(\frac{5!}{3!}\right) + \log\left(\frac{5!}{4!}\right)\right) =$$

$$\frac{37}{12} * \log 6 - \frac{1}{6}\log(720) - \frac{1}{36}\left(\log(5 * 5!) - \log(2!\,3!\,4!)\right) =$$

$$\frac{37}{12} * \log 6 + \frac{1}{36}\log(228) - \left(\frac{1}{6}\log(720) + \frac{1}{36}\log(600)\right)$$