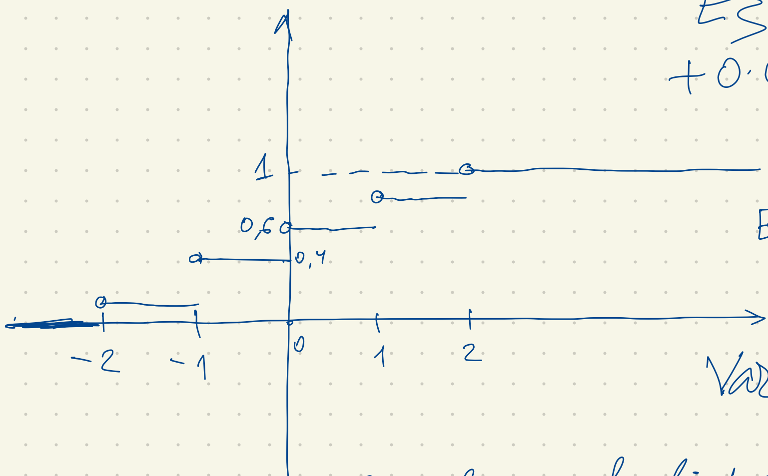
Lab 3

① $\xi \sim \begin{pmatrix} -2 & -1 & 0 & 1 & 2 \\ 0{,}1 & 0{,}3 & 0{,}2 & 0{,}2 & 0{,}2 \end{pmatrix}$



$E\xi = (-2)\cdot 0{,}1 + (-1)\cdot 0{,}3 + 0\cdot 0{,}2 + 1\cdot 0{,}2 + 2\cdot 0{,}2 = 0{,}1$

$E\xi^2 = 4\cdot 0{,}3 + 1\cdot 0{,}5 + 0\cdot 0{,}2 = 1{,}7$

$Var\,\xi = 1{,}7 - 0{,}1 = 1{,}6$

④ $X = \{$a number of ace of diamonds in the deck$\}$

$X \sim \begin{pmatrix} 1 & 2 & 3 & 4 & \dots & 52 \\ 1/52 & 1/52 & 1/52 & \dots & \dots & 1/52 \end{pmatrix}$ $\quad P(X \le 26) = 26 \cdot \frac{1}{52} = \frac{1}{2}$

$EX = \frac{1}{52} \cdot 52 \cdot \frac{1+52}{2} = \frac{53}{2} = 26.5$

⑥ 10 white
15 black

$X_i = \begin{cases} 1, & i\text{-th ball is white} \\ 0, & i\text{-th ball is black} \end{cases}$

$X = \sum_{i=1}^{8} X_i \qquad EX = \sum_{i=1}^{8} EX_i = 8\,EX_i = 8\,P(X_i = 1) = 8 \cdot \frac{10}{25} = 3{,}2$

(8) $X_i = \begin{cases} 1, & \text{the lift stops at } i^{th} \text{ floor} \\ 0, & \text{otherwise} \end{cases}$

$$X = \sum_{i=1}^{8} X_i = \text{number of stops that lift makes}$$

$$EX = \sum_{i=1}^{8} EX_i = 8EX_i = 8P(X_i = 1) =$$

$$= 8(1 - P(X_i = 0)) = 8\left(1 - \left(7/8\right)^{10}\right)$$

(9) $X(362) = 2$ $\quad X(363) = 1$ $\quad X(666) = 1$

$X_i = \begin{cases} 1, & \text{digit } i \text{ is present in the number} \\ 0, & \text{otherwise} \end{cases}$

$\frac{9}{10} \cdot \frac{9}{10}$

$\frac{8}{\cancel{9}} \cdot \frac{\cancel{9}}{10} \cdot \frac{9}{10} = 0,72$

$$X = X_2 + X_4 + X_6 + X_8 + X_0$$

$$EX = 4EX_2 + EX_0 = 4P(X_2 = 1) + P(X_0 = 1) =$$

$$= 4(1 - P(X_2 = 0)) + 1 - P(X_0 = 0) = 4 \cdot 0,28 + 0,19 =$$

$$= 1,31.$$

(10) $\xi_i = \begin{cases} 1, & \text{if sportsman } i \text{ overtook all players of team B} \\ 0, & \text{otherwise} \end{cases}$

ξ_i for players of teams A and C.

$a_i, b_1, b_2, \dots, b_{10}$

$$\xi = \sum_{i=1}^{33} \xi_i$$

$$E\xi = 33\, E\xi_i = 33\, \underbrace{P(\xi_i = 1)}_{\frac{1}{11}} = 3$$

1 2 3 4 5 . . . . . 39 40 41 42 43

(12) $X = Y + Z \Rightarrow X \sim Bin\left(6, \frac{1}{3}\right)$ $\quad X_i = \begin{cases} 1, & \text{4 or 6 is rolled} \\ 0, & \text{1,2,3 or 5 is rolled} \end{cases}$

$= X_1 + X_2 + \dots + X_6$

$$EX = 6 \cdot \frac{1}{3} = 2$$

$$Var\, X = 6 \cdot \frac{1}{3} \cdot \frac{2}{3} = \frac{4}{3}$$

(15) $\xi_i = \begin{cases} 1, & \text{exactly 1 person got off at floor } i \\ 0, & \text{otherwise} \end{cases}$

6 people

$$\xi = \sum_{i=1}^{8} \xi_i$$

$$E\xi = 8\, E\xi_1 = 8\, P(\xi_1 = 1) = 8 \cdot \binom{6}{1} \cdot \frac{1}{8} \cdot \left(\frac{7}{8}\right)^5 =$$

$$= 6 \cdot \left(\frac{7}{8}\right)^5$$

156 $\eta_i = \begin{cases} 1, & \text{exactly 2 got off at floor } i \\ 0, & \text{otherwise} \end{cases}$

$$\eta = \sum_{i=1}^{8} \eta_i$$

$$E\eta = 8\, E\eta_1 = 8 \cdot \binom{6}{2} \cdot \left(\frac{1}{8}\right)^2 \cdot \left(\frac{7}{8}\right)^4$$