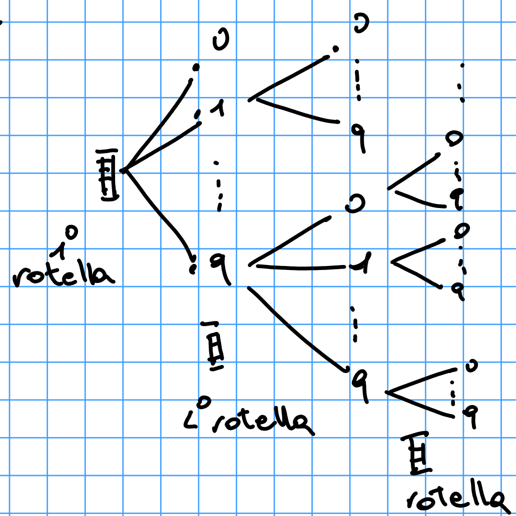
COMB.

(1)

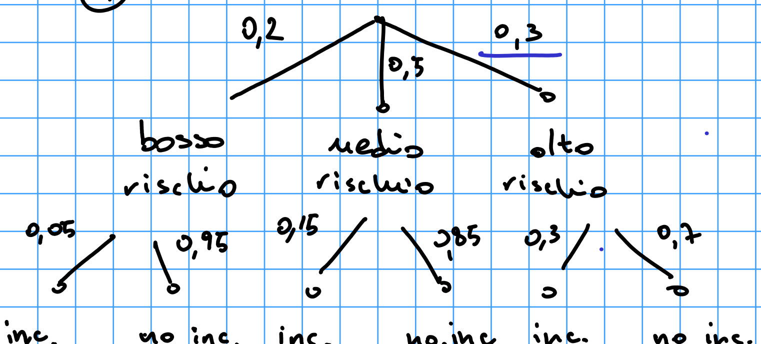


$$10^{\#\text{rotelle}} = 10^3$$

(2) cifre: $0, \dots, 9$

$$\underbrace{10\cdot 10\cdot 10\cdot 10\cdot 10}_{\#\text{ posizioni}} = 10^5$$

(1)



(1.1) $\mathbb{P}(\text{inc.}) = 0{,}2\cdot 0{,}05 + 0{,}5\cdot 0{,}15 + 0{,}3\cdot 0{,}3 = 0{,}175$

(1.2) $\mathbb{P}\left(\text{basso rischio} \mid \text{no inc.}\right) = \dfrac{\mathbb{P}(\text{no inc} \mid \text{basso rischio})\,\mathbb{P}(\text{basso rischio})}{\mathbb{P}(\text{no inc.})} = \dfrac{0{,}95\cdot 0{,}2}{0{,}2\cdot 0{,}95 + 0{,}5\cdot 0{,}15 + 0{,}3\cdot 0{,}7} = \dfrac{0{,}19}{0{,}825} \simeq 0{,}23$

$\mathbb{P}\left(\text{alto rischio} \mid \text{no inc}\right) = \dfrac{\mathbb{P}(\text{no inc.} \mid \text{alto r.})\,\mathbb{P}(\text{alto r.})}{\mathbb{P}(\text{no inc.})} = \dfrac{0{,}7\cdot 0{,}3}{0{,}825} \simeq 0{,}25$

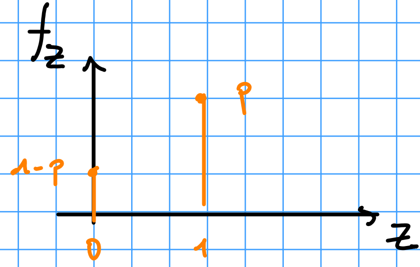
(2) $Z \sim \mathcal{B}(p)$

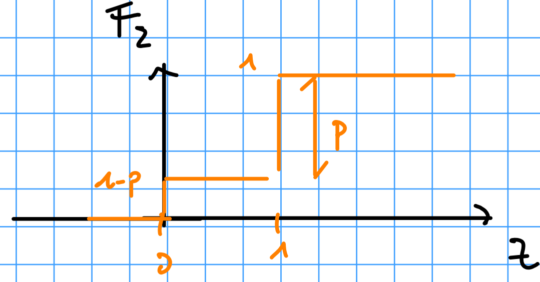
(2.1) $\mathbb{E}[Z] = 1\cdot \overset{p}{\mathbb{P}(Z=1)} + 0\cdot \overset{(1-p)}{\mathbb{P}(Z=0)} = 1p + 0\cdot(1-p) = p$

$\mathbb{V}[Z] = \mathbb{E}[Z^2] - \overset{p^2}{\mathbb{E}[Z]^2} = p - p^2 = p(1-p) = pq$

$\mathbb{E}[Z^2] = 1^2\, \underset{p}{\mathbb{P}(Z=1)} + 0^2\, \underset{(1-p)}{\mathbb{P}(Z=0)} = p \qquad q = 1-p$

(2.2)





$X = 2Z - 1$

(2.3) Discreta

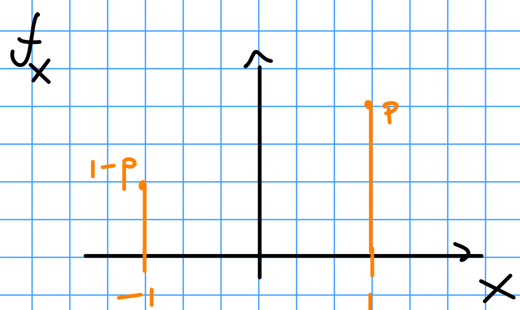
(2.4) $Z = 0 \iff X = -1 \qquad X \in \{-1, 1\}$

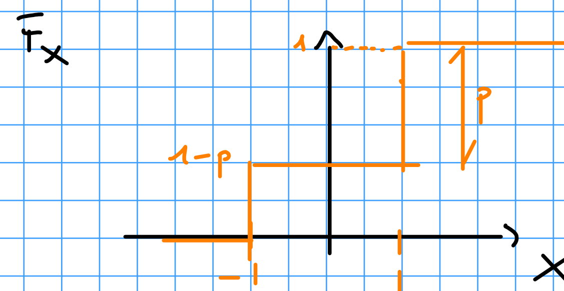
$Z = 1 \iff X = 1$

(2.5) $\mathbb{P}(X=1) = \mathbb{P}(2Z-1=1) = \mathbb{P}(2Z=2) = \mathbb{P}(Z=1) = p$

$\mathbb{P}(X=-1) = \mathbb{P}(2Z-1=-1) = \mathbb{P}(2Z=0) = \mathbb{P}(Z=0) = 1-p = q$

(2.6)





(2.7) $\mathbb{E}[X] = \mathbb{E}[2Z-1] = \mathbb{E}[2Z] - \mathbb{E}[+1]$

$= \mathbb{E}[2Z] - 1$

$= 2\,\mathbb{E}[Z] - 1 \quad = 2p - 1$

(2.8) $\mathbb{V}[X] = \mathbb{V}[2Z-1] = \mathbb{V}[2Z] = 4\,\mathbb{V}[Z] = 4(p)(1-p)$

$= 4p - 4p^2$

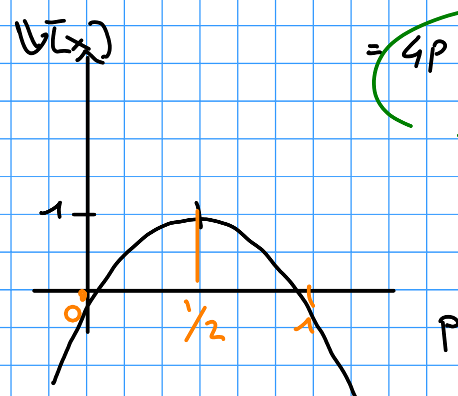
(2.9)

$\frac{d}{dp}\; 4p - 4p^2 = 0$

$4 - 8p = 0$

$4 = 8p$

$\frac{1}{2} = p$



quando $p = 1/2$

$4p - 4p^2 = 1$

$\cancel{4}^{2}\,\frac{1}{\cancel{2}_{1}} - 4\left(\frac{1}{2}\right)^2 = 2 - 1 = 1$

(3.1) $\mathbb{P}(X=1) = 1/3 \quad \mathbb{P}(X=2) = 3/7 \quad \mathbb{P}(X=3) = 1 - \left(\frac{1}{3} + \frac{3}{7}\right) = 5/21$

(3.2) $\mathbb{E}[X] = 1 \cdot \mathbb{P}(X=1) + 2 \cdot \mathbb{P}(X=2) + 3 \cdot \mathbb{P}(X=3)$

$= 1 \cdot \frac{1}{3} + 2 \cdot \frac{3}{7} + 3 \cdot \frac{5}{21} = 40/21$

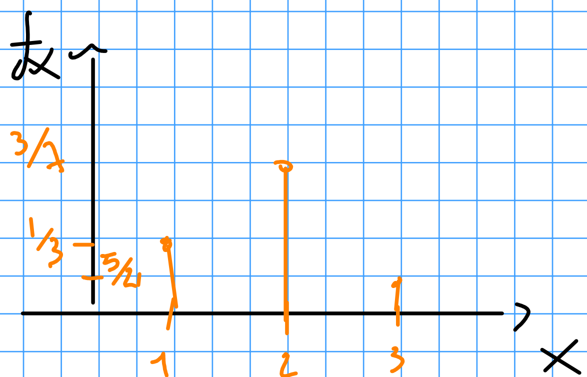
$\mathbb{E}[X^2] = 1^2\,\mathbb{P}(X=1) + 2^2\,\mathbb{P}(X=2) + 3^2 \cdot \mathbb{P}(X=3)$

$= 1 \cdot \frac{1}{3} + 4 \cdot \frac{3}{7} + 9 \cdot \frac{5}{21} = \frac{88}{21}$

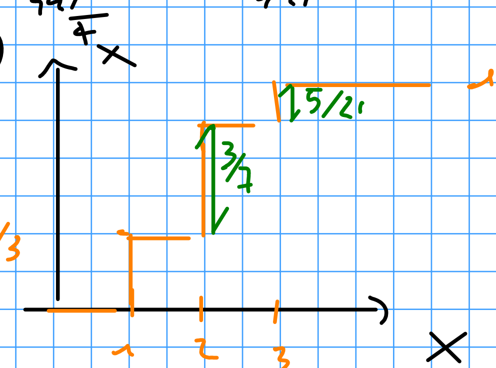
$\mathbb{E}[X]^2 = \left(\frac{40}{21}\right)^2 = \frac{1600}{441}$

$\mathbb{V}[X] = \mathbb{E}[X^2] - \mathbb{E}[X]^2 = \frac{88}{21} - \frac{1600}{441} = \frac{248}{441} \simeq 0,56$

(3.3)



(3.4)



(4)

votante è la v.a $X_i \sim B(p=0,7) \quad 1 \le i \le 10$

Binomiale $Z = \sum_{i=1}^{10} X_i$

$Z \sim \text{Binomiale}(p=0,7,\ n=10)$

$\mathbb{P}(Z=7) = \binom{10}{7}\left(\frac{7}{10}\right)^7\left(\frac{3}{10}\right)^3 \simeq 0,26$