

Es note / 01-04

1) lancio una moneta $P(\text{testa}) = \frac{1}{2}$
 e un dado $P(1) = P(2) = P(3) = P(4) = \frac{1}{6}$ e $P(5) = P(6) = \frac{1}{6}$
 scrivi tabella P congiunte e verifica l'uguaglianza con le corrisp P marg.

$X = \text{testa}$ $Y = \text{una faccia}$ sono eventi indipendenti
 $\begin{matrix} 0,1 \\ \text{no testa} \end{matrix}$ $\begin{matrix} 1-6 \end{matrix}$ (le monete non influenzano il dado)

| $x_i \backslash y_j$ | 1 | 2 | 3 | 4 | 5 | 6 | |
|----------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|--|
| 0 | $\frac{3}{10} \cdot \frac{1}{6}$ | $\frac{3}{10} \cdot \frac{1}{6}$ | $\frac{3}{10} \cdot \frac{1}{6}$ | $\frac{3}{10} \cdot \frac{1}{6}$ | $\frac{3}{10} \cdot \frac{1}{6}$ | $\frac{3}{10} \cdot \frac{1}{6}$ | $\rightarrow p_x(0) = \frac{36}{80} + \frac{18}{40} = \frac{72}{80}$ |
| 1 | $\frac{1}{10} \cdot \frac{1}{6}$ | $\frac{1}{10} \cdot \frac{1}{6}$ | $\frac{1}{10} \cdot \frac{1}{6}$ | $\frac{1}{10} \cdot \frac{1}{6}$ | $\frac{1}{10} \cdot \frac{1}{6}$ | $\frac{1}{10} \cdot \frac{1}{6}$ | $\rightarrow p_x(1) = \frac{4}{80} + \frac{2}{40} = \frac{8}{80}$ |
| | | | | | | | $\sum p_x = \frac{80}{80} = 1 \checkmark$ |

$p_y(1) = \frac{10}{80}$ $(2) = \frac{10}{80}$ $(3) = \frac{10}{80}$ $(4) = \frac{10}{80}$ $(5) = \frac{10}{80}$ $(6) = \frac{10}{80}$
 $\sum p_y = \frac{140}{280} + \frac{20}{40} = 1 \checkmark$

Osserva che: $P(x, y) = P_x(x) \cdot P_y(y)$ perché eventi indipendenti
 $= P(x) \cdot P(y)$

$$\begin{aligned}
 P(0,1) &= \left\{ \begin{aligned} P(1,1) &= \\ P(0,2) &= \frac{72}{80} \cdot \frac{10}{80} = 0,1125 = \frac{9}{80} \checkmark \\ P(0,3) &= \\ P(0,4) &= \\ P(0,5) &= \left\{ \begin{aligned} P(1,5) &= \\ P(0,6) &= \frac{72}{80} \cdot \frac{10}{40} = 0,0225 = \frac{9}{400} \checkmark \end{aligned} \right. \\ P(1,6) &= \left\{ \begin{aligned} P(1,2) &= \frac{8}{80} \cdot \frac{10}{80} = 0,0125 = \frac{1}{80} \checkmark \\ P(1,3) &= \\ P(1,4) &= \\ P(1,5) &= \left\{ \begin{aligned} P(1,6) &= \frac{8}{80} \cdot \frac{10}{40} = 0,025 = \frac{1}{40} \checkmark \end{aligned} \right. \end{aligned} \right.
 \end{aligned}$$

2) Calcolo cdf di)

scego arbitrariamente
a e b (tutte le combinazioni)

$$F(a,b) = \sum_{x_i \leq a} \sum_{y_j \leq b} p(x_i, y_j)$$

fissato $a=0, b=3$ ho $F(0,3) = F_x(0) \cdot F_y(3)$ perché indep

$$F_x(0) = \sum_{x_i \leq 0} \sum_{y_j} p(x_i, y_j) = 4 \cdot \frac{3}{80} + 2 \cdot \frac{3}{40} = \frac{32}{80}$$

cioè $p(0,1), p(0,2), \dots, p(0,4)$

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$$F_y(3) = \sum_{x_i} \sum_{y_j \leq 3} p(x_i, y_j) = p(0,1) + p(1,1) + \dots + p(2,3) + p(1,3) \\ = 3 \cdot \frac{9}{80} + 3 \cdot \frac{1}{80} = \frac{30}{80}$$

$$\text{Dunque } F(0,3) = \frac{32}{80} \cdot \frac{30}{80} = 0,338 \rightarrow 0 \leq F(0,3) \leq 1 \checkmark$$

3) Calcolo cdf es. note 1.3.2

$$F(a,b) = \sum_{x_i \leq a} \sum_{y_j \leq b} p(x_i, y_j)$$