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4.1.

Tiro costo 1 €
se prendo il bersaglio 5 €
fa centro il 35%

$$E = (5-1)(0,35) - (1)(0,65) = 0,75$$

4.2

3 palline senza reinserire

2	V	+ 1€ V
3	R	- 1€ R
5	B	+ 0€ B

-3, -2, -1, 0, 1, 2

P(-3) = RRR = 0,8 %

P(-2) = RRB, RBR, BRR = 12,5 %

P(-1) = RBB, BBR, BRB, RRV, VRR, RVR = 30 %

P(0) = BBB, VBR, VRB, RVB, RBV, BRV, BVR = 33,3 %

P(1) = VVR, VRV, RVV, VBB, BVB, BBV = 19,2 %

P(2) = VVB, VBV, BBV = 4,2 %

$$P_1 + P_2 + P_3 + P_4 + P_5 + P_6 = 1$$

$a_1 = -3 \quad a_2 = -2 \quad a_3 = -1 \quad a_4 = 0 \quad a_5 = 1 \quad a_6 = 2$

$P_1 = 0{,}8\% \quad P_2 = 12{,}5\% \quad P_3 = 30\% \quad P_4 = 33{,}3\% \quad P_5 = 19{,}2\% \quad P_6 = 4{,}2\%$

$$E[x] = \sum_{i=1}^{N} a_i P(i) =$$

$$= -3 \cdot 0{,}008 + (-2)(0{,}125) + (-1)0{,}3 + 0 \cdot 0{,}33 + 1(0{,}192) + 2(0{,}042) =$$

$$= -0{,}024 - 0{,}25 - 0{,}33 + 0 + 0{,}192 + 0{,}084 = -0{,}328$$

2 V $\quad V(+1€)$ $\{-2, -1, 0, 1, 2\}$
2 R $\quad R(-1€)$
6 B $\quad B(+0€)$

$P(-2) = RRB, RBR, BRR = 5\%$

$P(-1) = RRV, RVR, VRR, RBB, BRB, BBR = 26{,}6\%$

$P(0) = BBB, VBR, VRB, RVB, RBV, BRV, BVR = 36{,}6\%$

$P(1) = VBB, BVB, BBV, VVR, VRV, RVV = 26{,}6\%$

$P(2) = VVB, VBV, BVV = 5\%$

$a_1 = -2 \quad a_2 = -1 \quad a_3 = 0 \quad a_4 = 1 \quad a_5 = 2$

$P_1 = 0{,}05 \quad P_2 = 0{,}267 \quad P_3 = 0{,}334 \quad P_4 = 0{,}267 \quad P_5 = 0{,}05$

$$E[x] = -2(0{,}05) + (-1)0{,}267 + (0)0{,}334 + (1)0{,}267 + (2)0{,}05 = 0$$

4.3

$P\{X=-1\} = 0,3$ $\qquad E[2X^2 - 1]$

$P\{X=0\} = 0,5$

$P\{X=-1\} = 0,2$

$a_1 = -1 \qquad p_1 = 0,3$

$a_2 = 0 \qquad p_2 = 0,5$

$a_3 = 1 \qquad p_3 = 0,2$

$$E[2X^2 - 1] = (+2-1)\,0,3 + (-1)\,0,5 + (+2-1)\cdot 0,2 =$$

$$= 0$$

4.4.

$$Var(X+a) = E(X + \cancel{a} - E[X] - \cancel{a})^2 = Var(X)$$