HA – S. 112 / 3, 6, 8

S.112/3

a)

x_i	1	2	3	4	5	6
$P(X=x_i)$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$

$E(x) = \mu = 3{,}5$

$V(x) = \sigma^2 = 2{,}92 \;\rightsquigarrow\; \underline{\underline{\sigma = 1{,}71}}$

b)

y_i	2	3	4	5	6	7	8	9	10	11	12
$P(Y=y_i)$	$\frac{1}{36}$	$\frac{2}{36}$	$\frac{3}{36}$	$\frac{4}{36}$	$\frac{5}{36}$	$\frac{6}{36}$	$\frac{5}{36}$	$\frac{4}{36}$	$\frac{3}{36}$	$\frac{2}{36}$	$\frac{1}{36}$

$E(x) = \mu = 7$

$V(x) = \sigma^2 = 5{,}83$

$\rightsquigarrow \underline{\underline{\sigma = 2{,}42}}$

c)

z_i	0	1	2	3	4	5	6
$P(Z=z_i)$	$\left(\frac{1}{2}\right)^6$	$6\left(\frac{1}{2}\right)^6$	$15\cdot\left(\frac{1}{2}\right)^6$	$20\left(\frac{1}{2}\right)^6$	$15\left(\frac{1}{2}\right)^6$	$6\cdot\left(\frac{1}{2}\right)^6$	$1\cdot\left(\frac{1}{2}\right)^6$
$\Rightarrow$	$\frac{1}{64}$	$\frac{6}{64}$	$\frac{15}{64}$	$\frac{20}{64}$	$\frac{15}{64}$	$\frac{6}{64}$	$\frac{1}{64}$

Z = Anzahl der Wappen
dabei gilt:

6 Münzen werfen
= 6 mal 1 Münze werfen
S hat $2^6 = 64$ Elemente

$E(x) = \mu = 3$

$V(x) = \sigma^2 = 1{,}5 \;\rightsquigarrow\; \underline{\underline{\sigma = 1{,}22}}$

S. 112/6

x_i	0	1	2	3
$P(X=x_i)$	0,0179	0,089$\dot{3}$	0,178$\dot{6}$	0,1786

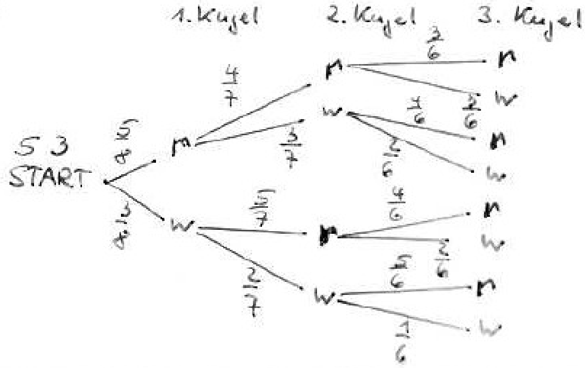
X = Anzahl der roten Kugeln

Urne: 8 Kugeln:
↳ 5 rot
3 weiß
3 maliges Ziehen ohne Zurücklegen

$E(X) = \mu = \underline{\underline{1{,}8753}}$ (rote Kugeln)

$V(x) = \sigma^2 = \underline{0{,}502}$

$\sigma = \underline{\underline{0{,}71}}$



S. 112/8

x_i	1	2	3	4	……	$(n-1)$	n
$P(X=x_i)$	$\frac{1}{n}$	$\frac{1}{n}$	$\frac{1}{n}$	$\frac{1}{n}$	…	$\frac{1}{n}$	$\frac{1}{n}$

$$E(x) = \mu = \frac{1}{n}\cdot\left(1+2+3+\ldots+(n-1)+n\right) = \frac{n+1}{2} \qquad \left(\sum_{i=1}^{n} i = \frac{n}{2}(n+1)\right)$$

$$V(x) = \sigma^2 = \frac{1}{n}\cdot\left(\left(1-\frac{n+1}{2}\right)^2 + \left(2-\frac{n+1}{2}\right)^2 + \ldots + \left(n-\frac{n+1}{2}\right)^2\right)$$

$$= \frac{1}{n}\cdot\left(\underbrace{1^2+2^2+3^2+\ldots+n^2}_{a^2} - \underbrace{\left(2\cdot 1\cdot\frac{n+1}{2} + 2\cdot 2\cdot\frac{n+1}{2} + \ldots + 2\cdot n\cdot\frac{n+1}{2}\right)}_{2ab} + \underbrace{n\cdot\left(\frac{n+1}{2}\right)^2}_{b^2}\right)$$

$$= \frac{1}{n}\cdot\left(\frac{n(n+1)(2n+1)}{6} - (n+1)\cdot(1+2+\ldots+n) + n\cdot\left(\frac{n+1}{2}\right)^2\right)$$

$$= \frac{1}{6}(n+1)(2n+1) - \frac{1}{2}(n+1)^2 + \frac{1}{4}(n+1)^2 = \underline{\underline{\frac{n^2-1}{12}}}$$