

S. M2/3

1)

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

$$E(X) = 1 \cdot \frac{1}{6} + \frac{2}{6} + \frac{3}{6} + \frac{4}{6} + \frac{5}{6} + \frac{6}{6} = \frac{21}{6} = \underline{\underline{3,5}} = \mu$$

$$\begin{aligned} V(X) &= \sum (x_i - \mu)^2 \cdot P(X=x_i) \\ &= (1-3,5)^2 \cdot \frac{1}{6} + (2-3,5)^2 \cdot \frac{1}{6} + \dots + (6-3,5)^2 \cdot \frac{1}{6} \\ &\approx 2,92 = \sigma^2 \quad \wedge \quad \underline{\underline{\sigma \approx 1,71}} \end{aligned}$$

mit CP: $\sum_{x=1}^6 ((x-3,5)^2 \cdot 1/6)$

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

$$E(X) = 2 \cdot \frac{1}{36} + 3 \cdot \frac{2}{36} + 4 \cdot \frac{3}{36} + \dots + 12 \cdot \frac{1}{36} = \underline{\underline{7}} = \mu$$

$$\begin{aligned} V(X) &= \sum (x_i - \mu)^2 \cdot P(X=x_i) \\ &= (2-7)^2 \cdot \frac{1}{36} + (3-7)^2 \cdot \frac{2}{36} + (4-7)^2 \cdot \frac{3}{36} + \dots + (12-7)^2 \cdot \frac{1}{36} \\ &\approx 5,83 = \sigma^2 \quad \wedge \quad \underline{\underline{\sigma \approx 2,42}} \end{aligned}$$

S. M2/6

x_i	0	1	2	3
$P(X=x_i)$	0,0179	0,0893	0,1786	0,1786
	$\cdot 1$	$\cdot 3$	$\cdot 3$	$\cdot 1$

X - Anzahl der roten Kugeln
3maliges Ziehen ohne Zurückl.

$$E(X) = 0 \cdot 0,0179 + 1 \cdot 3 \cdot 0,0893 + 2 \cdot 3 \cdot 0,1786 + 3 \cdot 1 \cdot 0,1786$$

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

$$\underline{\underline{V(X) = 0,502}} = \sigma^2 \quad \wedge \quad \underline{\underline{\sigma \approx 0,71}}$$

S. 112/8

2)

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

$$E(X) = (1+2+3+4+\dots+(n-1)+n) \cdot \frac{1}{n}$$

$$E(X) = \sum_{i=1}^n i \cdot \frac{1}{n}$$

$$E(X) = \frac{n}{2}(n+1) \cdot \frac{1}{n}$$

$$\underline{\underline{E(X) = \frac{n+1}{2} = \mu}}$$

$$V(X) = \left(\left(1 - \frac{n+1}{2}\right)^2 + \left(2 - \frac{n+1}{2}\right)^2 + \dots + \left(n - \frac{n+1}{2}\right)^2 \right) \cdot \frac{1}{n}$$

$$CP: \sum_{x=1}^n \left(\left(x - \frac{n+1}{2}\right)^2 \cdot \frac{1}{n} \right) = \underline{\underline{\frac{n^2-1}{12} = \sigma^2}}$$