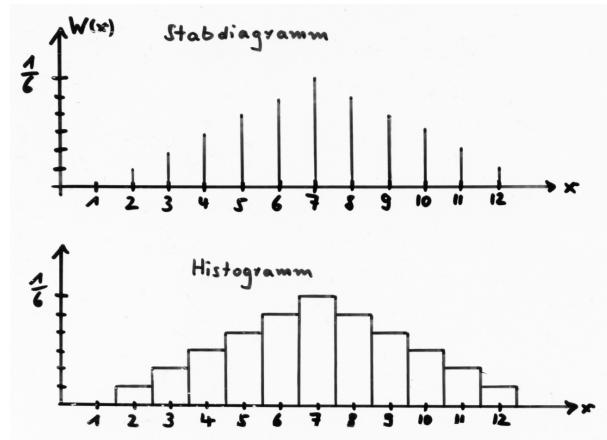


# LK Mathematik \* Wiederholung Zufallsgrößen \* Lösung

a)

x	2	3	4	5	6	7	8	9	10	11	12
W(x) = P(X = x)	1/36	2/36	3/36	4/36	5/36	6/36	5/36	4/36	3/36	2/36	1/36

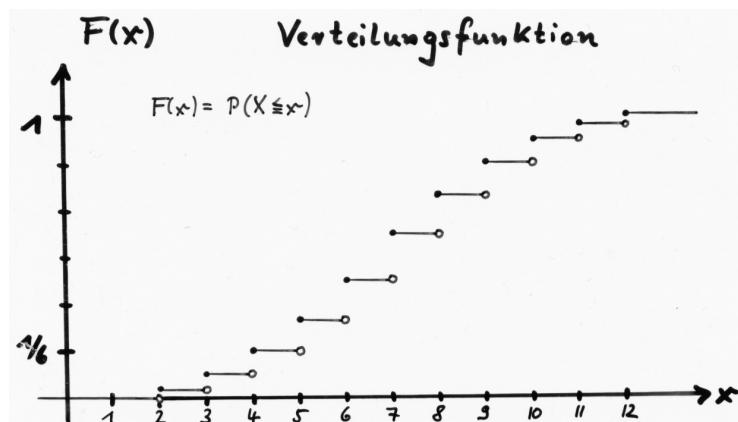


b)  $P(X = 3) = \frac{2}{36} = \frac{1}{18}$  ;  $P(X = 0,5) = 0$  ;  $P(3 < x < 6) = P(X = 4) + P(X = 5) = \frac{7}{36}$

$$W(4) = P(X = 4) = \frac{3}{36} = \frac{1}{12} ; F(4) = P(X \leq 4) = \frac{1+2+3}{36} = \frac{6}{36} = \frac{1}{6}$$

c)  $P(\text{,,Die Augensumme beträgt mindestens } 9\text{,}) = P(X \geq 9) = \frac{4+3+2+1}{36} = \frac{10}{36} = \frac{5}{18}$

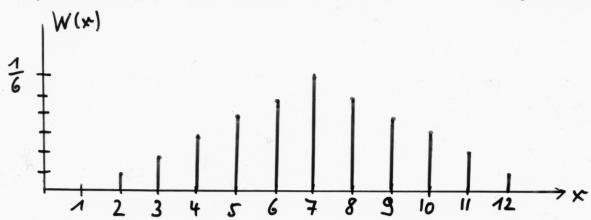
d)



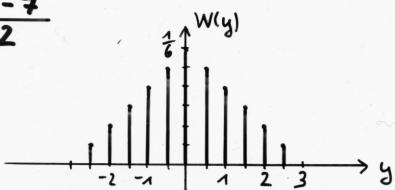
$$F(x) = \begin{cases} 0 & \text{falls } x < 2 \\ \frac{1}{36} & \text{falls } 2 \leq x < 3 \\ \frac{3}{36} & \text{falls } 3 \leq x < 4 \\ \frac{6}{36} & \text{falls } 4 \leq x < 5 \\ \vdots & \\ 1 & \text{falls } 12 \leq x \end{cases}$$

e)

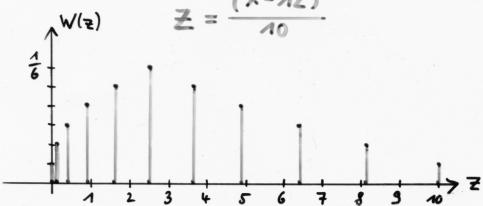
Ex.: Wurf von 2 Laplace-Würfeln       $X$ : „Augensumme“



$$Y = \frac{X - 7}{2}$$

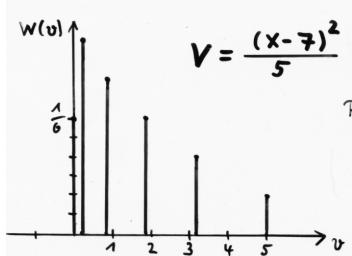


$$z = \frac{(x-12)^2}{10}$$



$$V = \frac{(x-7)^2}{5}$$

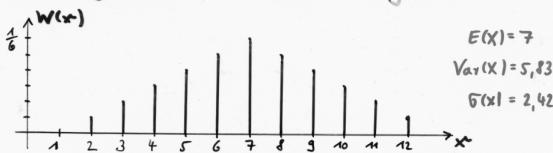
$$\begin{aligned} \mathcal{P}(V = \frac{1}{5}) &= \mathcal{P}(X = 8) + \mathcal{P}(X = 6) = \\ &= \frac{5}{36} + \frac{5}{36} = \frac{10}{36} \end{aligned}$$



Exp.: Wurf von 2 Laplace-Würfeln

$X := \text{"Augensumme"} \quad Y := \text{"Größte Augenzahl"}$

f)



$$E(X) = 7$$

$$\text{Var}(X) = 5,83$$

$$\bar{y}(x_1 = 2,42)$$

$$E(Y) = 4.47$$

$$\text{Var}(Y) = 1.57$$

$$\sigma(Y) = 1.40$$

$X$	2	3	4	5	6	7	8	9	10	11	12	$P(Y=y)$
1	$\frac{1}{36}$	0	0	0	0	0	0	0	0	0	0	$\frac{1}{36}$
2	0	$\frac{2}{36}$	$\frac{1}{36}$	0	0	0	0	0	0	0	0	$\frac{3}{36}$
3	0	0	$\frac{2}{36}$	$\frac{2}{36}$	$\frac{1}{36}$	0	0	0	0	0	0	$\frac{5}{36}$
4	0	0	0	$\frac{2}{36}$	$\frac{3}{36}$	$\frac{2}{36}$	$\frac{1}{36}$	0	0	0	0	$\frac{7}{36}$
5	0	0	0	0	$\frac{2}{36}$	$\frac{3}{36}$	$\frac{5}{36}$	$\frac{2}{36}$	$\frac{1}{36}$	0	0	$\frac{9}{36}$
6	0	0	0	0	0	$\frac{2}{36}$	$\frac{3}{36}$	$\frac{2}{36}$	$\frac{2}{36}$	$\frac{2}{36}$	$\frac{1}{36}$	$\frac{11}{36}$
$P(X=x)$	$\frac{1}{36}$	$\frac{2}{36}$	$\frac{3}{36}$	$\frac{4}{36}$	$\frac{5}{36}$	$\frac{6}{36}$	$\frac{5}{36}$	$\frac{4}{36}$	$\frac{3}{36}$	$\frac{2}{36}$	$\frac{1}{36}$	

$$\frac{2}{36} = P(X=5 \wedge Y=3) \neq P(X=5) \cdot P(Y=3) = \frac{4}{36} \cdot \frac{5}{36}$$

$\Rightarrow$  X und Y sind voneinander abhängige Zufallsgrößen!