$\boxed{\text{Aufgabe 11}}$ Betrachte $X_i : \Omega \to \{0,1\}$ wobei $\{X_i = 1\} = \{3 \text{ fällt}\}$, $\{X_i = 0\} = \{3 \text{ fällt nicht}\}$. Also $P(X_i = 1) = \frac{1}{6}$, $P(X_i = 0) = \frac{5}{6}$. Es gilt

$\mathbb{E}X_i = \frac{1}{6}$, $\mathbb{V}X_i = \mathbb{E}X_i^2 - (\mathbb{E}X_i)^2 = \frac{1}{6} - \frac{1}{36} = \frac{5}{36}$ und mit

$S_n = \sum_{i=1}^{n} X_i$ folgt $S_n^* = \frac{S_n - \mathbb{E}(S_n)}{\sqrt{\mathbb{V} S_n}} = \frac{S_n - \frac{n}{6}}{\sqrt{\frac{5}{36} n}}$. Da $(X_i)_{i \in \mathbb{N}}$

iid, folgt aus ZGWS: $\lim_{n \to \infty} P(S_n^* \geq b) = \frac{1}{\sqrt{2\pi}} \int_b^\infty e^{-x/2} \, dx$

also n gross: $P(S_n \geq c) = P\left(S_n^* \geq \frac{c - n/6}{\sqrt{\frac{5}{36} n}}\right) \approx \frac{1}{\sqrt{2\pi}} \int_{\frac{c - n/6}{\sqrt{\frac{5}{36} n}}}^{\infty} e^{-x^2/2} \, dx$

<u>Hier:</u>

$n = 3600$, $c = 630 \Rightarrow \frac{c - n/6}{\sqrt{\frac{5}{36} n}} = \frac{630 - 360}{\sqrt{500}} = \frac{290}{\sqrt{500}} \approx 1{,}34$

$\Rightarrow P(S_n \geq 630) \approx 1 - \int_{-\infty}^{1{,}34} \frac{1}{\sqrt{2\pi}} e^{-x^2/2} \, dx \approx 1 - 0{,}91 = 0{,}09$