Wahrscheinlichkeitsrechnung (I)
Lösungen

1. (a) $\frac{1}{2}$ (b) $\frac{11}{30}$ (c) $\frac{1}{2}$ (d) $\frac{1}{6}$ (e) $\frac{7}{10}$ (f) $\frac{2}{3}$ (g) $\frac{1}{3}$

2. (a) $\frac{1}{7\cdot 6}=\frac{1}{42}$ (b) $\frac{1}{\binom{7}{2}}=\frac{1}{21}$

3. $\frac{2\cdot 2}{8\cdot 7\cdot 6\cdot 5}=\frac{1}{420}$

4. $\frac{18}{36}=\frac{1}{2}$

5. $\frac{15}{36}=\frac{5}{12}$

6. $\frac{1}{2}$

   (Wenn für die gewürfelten Zahlen $a+b+c>10$ gilt, dann gilt für die verdeckten Augenzahlen $(7-a)+(7-b)+(7-c)=21-(a+b+c)\leq 10$.)

7. (a) $\frac{1}{6^3}=\frac{1}{216}$ (b) $\frac{3\cdot 5^2}{6^3}=\frac{25}{72}$ (c) $\frac{3\cdot 5}{6^3}=\frac{5}{72}$

   (d) $\frac{25}{72}+\frac{5}{72}+\frac{1}{216}=\frac{91}{216}$

8. (a) i. $1-\frac{2^3}{3^3}=\frac{19}{27}$ ii. $\frac{3\cdot 2^2}{3^3}=\frac{4}{9}$ iii. $\frac{2^3}{3^3}+\frac{4}{9}=\frac{20}{27}$

   (b) $\frac{99^n}{100^n}=\left(\frac{99}{100}\right)^n<0.25$, also $n\geq 138$

9. $\frac{\binom{16}{8}\cdot\binom{16}{8}}{\binom{32}{16}}\approx 27.6\%$

10. (a) $\frac{1}{9}+\frac{1}{9}=\frac{2}{9}$ (b) $\frac{1}{2}+\frac{1}{4}-\frac{1}{4}=\frac{1}{2}$ (c) $\frac{1}{2}+\frac{20}{36}-\frac{10}{36}=\frac{7}{9}$

    (d) $\frac{12}{36}+\frac{1}{4}-\frac{3}{36}=\frac{1}{2}$

11. $1-\frac{36\cdot 32\cdot 28}{36\cdot 35\cdot 34}\approx 24.7\%$

12. (a) $\frac{4\cdot\left[2\cdot\binom{30}{4}+3\cdot\binom{29}{4}\right]}{\binom{36}{9}}\approx 0.536\%$ (b) $\frac{13\cdot\binom{4}{3}\cdot 12\cdot\binom{4}{2}}{\binom{52}{5}}\approx 0.144\%$

13. (a) $\frac{2\cdot(N!)^2}{(2N)!}$ $\frac{2\sqrt{\pi N}}{4^N}\approx 10^{-600}$

14. $P(k)=\frac{\binom{4}{k}\cdot\binom{8}{3-k}}{\binom{12}{3}}$; $P(0)=\frac{14}{55}$, $P(1)=\frac{28}{55}$, $P(2)=\frac{12}{55}$, $P(3)=\frac{1}{55}$

15. (a) $1-\frac{\binom{95}{5}}{\binom{100}{5}}\approx 23.0\%$ (b) $1-\left[\frac{\binom{95}{5}}{\binom{100}{5}}+\frac{\binom{5}{1}\cdot\binom{95}{4}}{\binom{100}{5}}\right]\approx 1.90\%$