



Übungen zur **Mathematik I für Biologen und Sportwissenschaftler**

Freiwillige Zusatzaufgaben zur **Kombinatorik**

Lösungen

(1) $\frac{64}{5}$

(2) $\sum_{i=1}^7 \binom{9}{i} 2^3 = 4008, \quad \sum_{i=0}^9 \binom{10}{i} 5^{i+1} (-3)^{9-i} = \frac{5}{3} (5^{10} - 2^{10}) = 16274335,$

$$\sum_{k=0}^{10} \binom{10}{k} \frac{1}{2^{2k}} = \left(\frac{5}{4}\right)^{10}, \quad \sum_{k=0}^{10} \frac{1}{2^{k+2}} = \frac{2047}{4096}.$$

(3) $\sum_{i=1}^{10} \prod_{l=1}^{10} 2 = 10240, \quad \prod_{k=2}^4 \sum_{j=0}^k (4-j) = 900, \quad \prod_{k=1}^4 \prod_{j=1}^k 2^{-j} = 2^{-20} = \frac{1}{1048576}.$

(4) $\frac{N!}{N_1! N_2! N_3! N_4!}$

(5) a) $\sum_{i=1}^{20} (2i+1) = 440, \quad \sum_{i=1}^n (2i+1) = (n+2)n, \quad \sum_{k=0}^{24} (\sqrt{k+1} - \sqrt{k}) = 5.$

b) $N = 9.$

(6) a) $\frac{30!}{[6!]^5},$ b) $\frac{30!}{118![7!]^3},$ c) $\frac{30!}{2!4!6!8!10!}.$

(7) $A = \sum_{n=2}^{50} 2n = 2548$

$$B = \sum_{n=2}^{25} n^2 = 5524$$

$$C = \sum_{n=2}^8 2^n = 508$$