Seth Temple
sdtemple@uw.edu

Pedigree Formulas

1 Kinship

- path counting: $\psi = \sum_{A \in \mathcal{A}} \sum_{\mathcal{P}(A)} (1 + f_A)(1/2)^{n(\mathcal{P}(A))+1}$
- condensed IBD states: $\psi = \Delta_1 + 1/2 \cdot (\Delta_3 + \Delta_5 + \Delta_7) + 1/4 \cdot \Delta_8$
- (non-inbred) gene identity states: $\psi = 1/2 \cdot \kappa_2 + 1/4 \cdot \kappa_1 + 0 \cdot \kappa_0 = (2\kappa_2 + \kappa_1)/4$
- parental kinships: $\psi(A, B) = 1/4 \cdot (\psi(M_A, M_B) + \psi(F_A, F_B) + \psi(M_A, F_B) + \psi(F_A, M_B))$

2 (Non-inbred) Gene Identity States

κ probabilities are for pedigrees without inbreeding.

- $\kappa_2 + \kappa_1 + \kappa_0 = 1$
- parental kinships: $\kappa_2 = \psi(M_A, M_B)\psi(F_A, F_B) + \psi(M_A, F_B)\psi(F_A, M_B)$
- condensed IBD states: $\kappa_2 = \Delta_7$, $\kappa_1 = \Delta_8$, $\kappa_0 = \Delta_9$

3 Inbreeding

- kinship: $f(A) = \psi(M_A, F_A)$
- condensed IBD states: $f(A) = \Delta_1 + \Delta_2 + \Delta_3 + \Delta_4$ or $f(B) = \Delta_1 + \Delta_2 + \Delta_5 + \Delta_6$