- MME:

$$\begin{bmatrix} X^TX + \sigma_e^{-2} & X^TZ \cdot \sigma_e^{-2} \\ Z^TX \cdot \sigma_e^{-2} & Z^TZ \cdot \sigma_e^{-2} + G^{-1} \end{bmatrix} \begin{bmatrix} \hat{\beta} \\ \hat{s} \end{bmatrix} = \begin{bmatrix} X^Ty \cdot \sigma_e^{-2} \\ Z^Ty \cdot \sigma_e^{-2} \end{bmatrix} \quad // \cdot \sigma_e^2$$

$$\begin{bmatrix} X^TX & X^TZ \\ Z^TX & Z^TZ + G^{-1} \cdot \sigma_e^2 \end{bmatrix} \begin{bmatrix} \hat{\beta} \\ \hat{s} \end{bmatrix} = \begin{bmatrix} X^Ty \\ Z^Ty \end{bmatrix}$$

$G^{-1} \cdot \sigma_e^2 \rightarrow I \cdot \frac{\sigma_e^2}{\sigma_s^2} \rightarrow I \cdot \lambda$ with $\lambda = \frac{\sigma_e^2}{\sigma_s^2}$

- $G = var(s) = \begin{bmatrix} var(s_1) & cov(s_1, s_2) & cov(s_1, s_3) \\ cov(s_2, s_1) & var(s_2) & cov(s_2, s_3) \\ cov(s_3, s_1) & cov(s_3, s_2) & var(s_3) \end{bmatrix}$

- From data set (pedigree) we can see that sires 1-3 do not have any known parents
  - $\Rightarrow$ cov between their effects is $\emptyset$: $cov(s_1, s_2) = cov(s_1, s_3) = cov(s_2, s_3) = \emptyset$

$var(s_i) = \sigma_s^2$

$\Rightarrow G = I \cdot \sigma_s^2 \Rightarrow G^{-1} = I \cdot \sigma_s^{-2}$