- Example with small dataset on influence of breed on observation

- Model : $y = X \cdot b + e$

  y: vector of observations

  b: vector of breed levels : $b = \begin{bmatrix} b_0 \\ b_{Angus} \\ b_{Limousin} \\ b_{Simmental} \end{bmatrix} = \begin{bmatrix} \mu \\ \alpha_1 \\ \alpha_2 \\ \alpha_3 \end{bmatrix}$

  e: vector of random residuals

  X: design matrix $\underbrace{\text{linking breed levels to observations}}$

  "which observation comes from animal of a given breed"

- Information from dataset to model:

$$y = \begin{bmatrix} 16 \\ 10 \\ \vdots \\ 13 \end{bmatrix} ; \quad e = \begin{bmatrix} e_1 \\ e_2 \\ \vdots \\ e_6 \end{bmatrix} ; \quad X = \begin{array}{c|cccc} & b_0 & b_A & b_L & b_S \\ \hline 1 & 1 & 1 & 0 & 0 \\ 2 & 1 & 1 & 0 & 0 \\ & & & & \\ 6 & 1 & 0 & 0 & 1 \end{array}$$

- $b^{(0)}$ computed as : $b^{(0)} = \begin{bmatrix} 13.5 \\ 1.5 \\ 13.5 \\ -1.5 \end{bmatrix} ; \quad \tilde{b} = b^{(0)} + (G(X^TX) - I) \cdot z$

- Check: $(X^TX) b^{(0)} = X^Ty \Leftrightarrow (X^TX) b^{(0)} - X^Ty = 0$