183. For any sets of constants $\boldsymbol{a} = (a_1, ..., a_k)$ and $\boldsymbol{b} = (b_1, ..., b_k)$, show that under the oneway ANOVA assumptions

$$\text{Cov}\left(\sum_{i=1}^{k} a_i \bar{Y}_i, \sum_{i=1}^{k} b_i \bar{Y}_i\right) = \sigma^2 \sum_{i=1}^{k} \frac{a_i b_i}{n_i}$$

Therefore, in the oneway ANOVA cell means model, contrasts are uncorrelated (orthogonal) if $\sum_{i=1}^{k} a_i b_i / n_i = 0$.