110. One advantage of using a minimal sufficient statistic is that unbiased estimators will have smaller variance, as the following will show. Suppose that T_1 is sufficient and T_2 is minimal sufficient, U is an unbiased estimator of θ and define $U_1 = \mathrm{E}[U|T_1]$ and $U_2 = \mathrm{E}[U|T_2]$.

(a) Show that $U_2 = \mathrm{E}[U_1|T_2]$.

(b) Now use the conditional variance formula to show that $\mathrm{Var}(U_2) \leq \mathrm{Var}(U_1)$.