Name _____

Student Number _____

STA 260 S2020 Practice Exam

This is not a full practice exam, though it is a reasonable question. The goal is to make sure the system works.

1. (100 Points) Let $X_1, \ldots, X_{n_1}$ be a random sample from a distribution with expected value μ and *known* variance σ_1^2. Independently of the X_j, let $Y_1, \ldots, Y_{n_2}$ be a random sample from a distribution with the same expected value μ and known variance σ_2^2. We will estimate μ with $\widehat{\mu} = a\,\overline{X} + (1-a)\,\overline{Y}$, where $0 \leq a \leq 1$.

   (a) Show that $\widehat{\mu}$ is unbiased for μ.

   (b) Find the value of a that makes $Var(\widehat{\mu})$ as small as possible. Show your work. **Circle your final answer**.