# STA247 HW3

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## Problem 1

### (a)

1. The finite population correction is $(1 - \frac{n}{N}) = (1 - \frac{400}{4000}) = 0.9$
2. The finite population correction is $(1 - \frac{30}{300}) = 0.9$
3. The finite population correction is $(1 - \frac{3000}{300000000}) = 0.99999$

Based on the calculation, the third design has a finite population correction closest to 1.

### (b)

The variance for statistic that estimate a population mean can be calculated as

$$Var[\hat{y}] = \frac{\sigma^2}{n}(1 - \frac{n}{N})$$

Variance for 1 will be,

$$0.9\frac{\sigma^2}{400} = 0.0022\sigma^2$$

Variance for 2 will be,

$$0.9\frac{\sigma^2}{30} = 0.03\sigma^2$$

Vairance for 3 will be,

$$0.99999\frac{\sigma^2}{3000} = 0.0003\sigma^2$$

I think the third design will have the best precision for estimating a population mean.

## Problem 2

## Problem 3