

# Homework 4

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## 5.2

$$n_i = n \times \left( \frac{N_i \sigma_i}{\sum_{k=1}^L N_k \sigma_k} \right)$$

```
n = 30
sigma = c(6,5,3)
N = c(132,92,27)
```

```
sum_N_sigma = sum(N*sigma)
print(sum_N_sigma)
```

```
## [1] 1333
```

```
find_n_i = function(n, N_i, sigma_i) {
  n_i = n * N_i * sigma_i / sum_N_sigma
  n_i
}
```

```
vecto_n = sapply(1:length(N), function(x) {
  ans = find_n_i(n, N[x], sigma[x])
  print(c(N[x], sigma[x]))
  ans = round(ans, 0)
})
```

```
## [1] 132  6
## [1] 92  5
## [1] 27  3
```

```
vecto_n
```

```
## [1] 18 10  2
```

## 5.5

$$V(\overline{N_{yst}}) = \frac{B}{4N^2} = D$$

$$n = \frac{(\sum_{i=1}^L N_i \sigma_i \sqrt{c_i})(\sum_{k=1}^L N_k \sigma_k / \sqrt{c_k})}{N^2 D + \sum_{i=1}^3 N_i \sigma_i^2}$$

$$n_i = n \times \left( \frac{N_i \sigma_i / \sqrt{c_i}}{\sum_{k=1}^L N_k \sigma_k / \sqrt{c_k}} \right)$$

```

D = 0.1
c = c(9, 25, 36)
sigma = c(1.5, 1.8, 1.8)
N = c(112,68,39)

sum_sigma_mul_sqrt_c = sum(N*sigma*sqrt(c))
sum_sigma_divide_sqrt_c = sum(N*sigma/sqrt(c))

sum_sigma_c = sum_sigma_mul_sqrt_c * sum_sigma_divide_sqrt_c

sum_sigma_c_2 = sum(N*sigma^2)

find_n <- function(N,sigma,c,D) {
  sum_n = sum(N)
  n = sum_sigma_c / (sum_n^2 * D + sum_sigma_c_2)
  n = round(n, 0)
  n
}
n = find_n(N, sigma, c, D)
n

```

```
## [1] 26
```

```

find_n_i <- function(N,sigma,c,n,i) {
  n_i = n*((N*sigma/sqrt(c))/sum_sigma_divide_sqrt_c)
  n_i }

result = sapply(1:length(N), function(x) {
  res = find_n_i(N[x],sigma[x],c[x],n,x)
  res = round(res, 0)
})
result

```

```
## [1] 16 7 3
```