# PS 8

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## Question 1

1. The sample mean is 164.32.
2. The variance of the sample is 383.6951.
3. The standard deviation of the sample is 19.58814.

```
n<- 10

weight<- c(165.5, 175.4, 144.1, 178.5, 168, 157.9, 170.1, 202.5, 145.5, 135.7)

mu<-mean(weight)

varweight<- var(weight)

sigma<- (sqrt(varweight))

print(mu)
```

```
## [1] 164.32
```

```
print(varweight)
```

```
## [1] 383.6951
```

```
print(sigma)
```

```
## [1] 19.58814
```

## Question 2

Assuming n is large, I would think it would be unbiased. We know the equation for the sample mean is unbiased, and this is just squaring that equation. Random sampling allows us to use the sample average as an unbiased estimator, and I don't think squaring that equation would eliminate that.

## Question 3

1. The expected mean volume is 500 ml.
2. The standard error of the mean volume for the daily sample is 1.
3. P($\mu$>502) = 0.02275013

```
mu=500
sd=6
n=36

var=sd^2



se = sqrt(var/n)

z<- ((502-500)/se)

print(z)
```

```
## [1] 2
```

```
prob<-  1- pnorm(2)

print(prob)
```

```
## [1] 0.02275013
```

## Question 4

The confidence interval is ≈(47.78, 52.42).

$$CI(\alpha) = [\overline{X}_n - z_{\alpha/2} * standard\ error, \overline{X}_n + z_{\alpha/2} * standard\ error]$$

$$CI(\alpha) = [(50.1 - 2.575829 * 0.9), (50.1 + 2.575829 * 0.9)]$$

$$CI(\alpha) = [47.78175, 52.41825]$$

```
var=81
sd=9
mu=50.1
n=100
se=(sqrt(var)/sqrt(n))
z<- qnorm(0.995)

upper<- mu+(z*se)
lower<- mu-(z*se)
```

```r
confint<- c(lower, upper)

print(confint)
```

```
## [1] 47.78175 52.41825
```