Exercise 4

Problem 4.1

In [7]:

```
from random import seed
from random import randint

# seed random number generator
seed(1)

# create a 10000 size empty list
value = [None] * 10000

# generate random integers
for k in range(10000):
    value[k] = randint(16, 170)
    #print(value)
```

N(170, 16)? -1

Problem 4.2

In [8]:

```
from random import choice
from statistics import mean
import numpy as np
import statistics

# create a 50 size empty list
selection = [None] * 50

# take 50 random samples from the population
for k in range(50):
    selection[k] = choice(value)

# calcualte mean
mean_population = mean(selection)
print("Mean of the population is:", mean_population)
#Sample mean is an unbiased estimator of the population mean.

# calcualte variance
variance_population = np.var(selection)
print("Variance of the population is: ", "%.2f" % round(variance_population, 2))
#Sample variance is an unbiased estimator of the population variance.

# calcualte standard deviation
standard_deviation = statistics.stdev(selection)
print("Standard Deviation of the population is: ", "%.2f" % round(standard_deviation, 2))
#Standard variance is a biased estimator of the population standard variance.
```

```
Mean of the population is: 85.04
Variance of the population is:  1634.76
Standard Deviation of the population is:  40.84
```

Problem 4.3

In [9]:

```
def my_median(sample):
    n = len(sample)
    index = n

    # Sample with an odd number of observations
    if n % 2:
        return sorted(sample)[index]

    # Sample with an even number of observations
    return sum(sorted(sample)[index - 1:index + 1]) / 2
```

In [10]:

```
median_population = my_median(selection)
print("Median of the population is: ", "%.2f" % round(median_population, 2))
```

```
Median of the population is:  84.00
```

In [14]:

```
# import numpy as np

k = 30
print('The 31-th order statistic is:', np.partition(np.asarray(selection), k)[k])
```

When you use package functions you need to explain what you are doing

-1

```
The 31-th order statistic is: 94
```

Problem 4.3

In [12]:

```
from scipy import stats

truncated_mean = [None] * 10

k_range = [0.1, 0.2, 0.3, 0.4, 0.5]

for i in k_range:
    truncated_mean = stats.trim_mean(selection, i)
    print("Truncated mean for i is: ", "%.2f" % round(truncated_mean, 2))

    if(truncated_mean == median_population):
          print("Mean and Median are Same.")
    #In a perfectly symmetrical distribution, the mean and the median are the same [1].
    #[1] https://courses.lumenlearning.com/introstats1/chapter/skewness-and-the-mean-median
```

-1 *

```
Truncated mean for i is:  83.15
Truncated mean for i is:  81.07
Truncated mean for i is:  79.25
Truncated mean for i is:  77.90
Truncated mean for i is:  nan
```

Which k?

-1

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