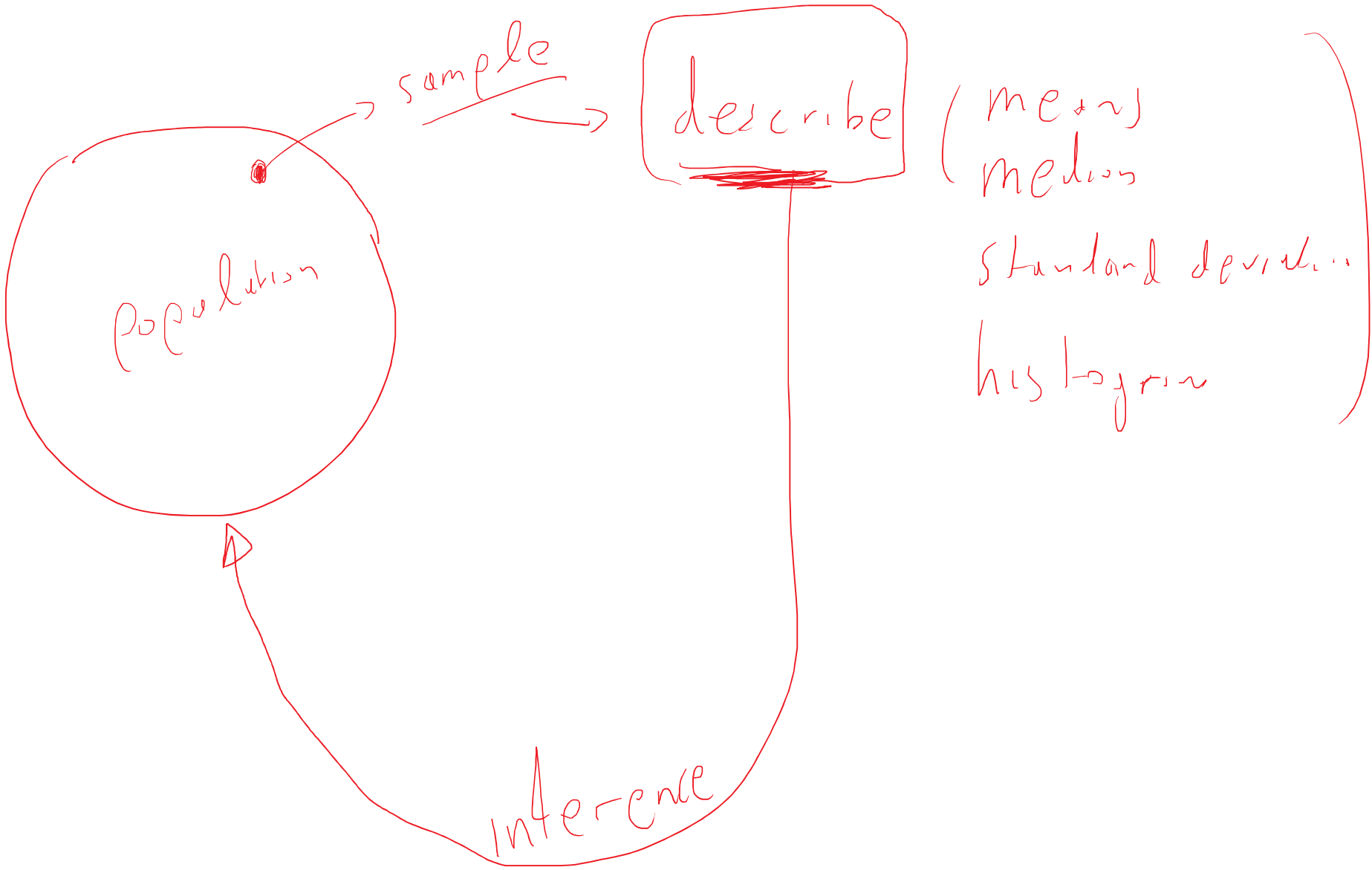

sample
describe
population
mean
median
standard deviation
histogram
inference

$R = \max X_i - \min X_i = 21.4 - 16.1 = 5.3$

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
length	140	5.3	16.1	21.4	18.802	1.1205	1.255	-.110	.205	-.400	.407
Valid N (listwise)	140										

$n = 140$

Sample size

$\min X_i$

$\max X_i$

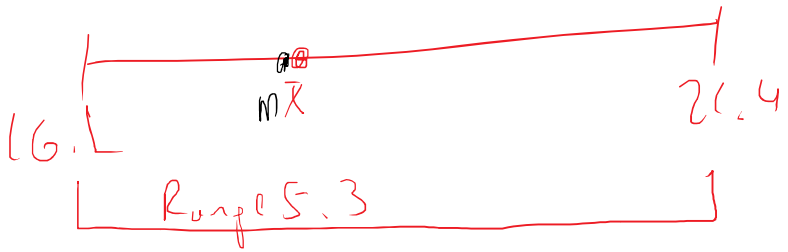
$\bar{X} = \frac{\sum X_i}{n} = \frac{17.3 + \ldots + 17.7}{140} = 18.802$

$X_1, X_2, \ldots, X_{140}$

Variable	Median	
forearm length	18.800	19

$m = 18.8$

50% 50%

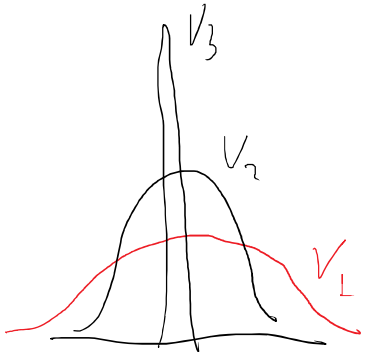


Std. Deviation	Variance
Statistic	Statistic
1.1205	1.255

$$s^2 = \frac{1}{n-1}\sum (x_i - \bar{x})^2 \geq 0$$

$$s = \sqrt{s^2}$$

has the same units with r.v. X



$$V_1 > V_2 > V_3$$

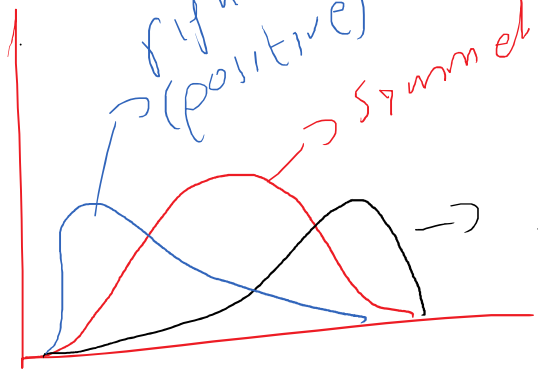
under the normal dist. assump.

$$\left(\bar{x} - 3s \right)$$
$$\left(\bar{x} + 3s \right)$$

$\bar{x}$ = 18.9, s = 1.1

18.9 − 3·1.1 → 12.1

18.9 + 3·1.1 → 15.5



$a_3 > 0$

$a_3 \approx 0$

$a_3 < 0$

a_3 : skewness coefficient

Skewness	
Statistic	Std. Error
-.110	.205

$a_3 = -0.110 < 0$

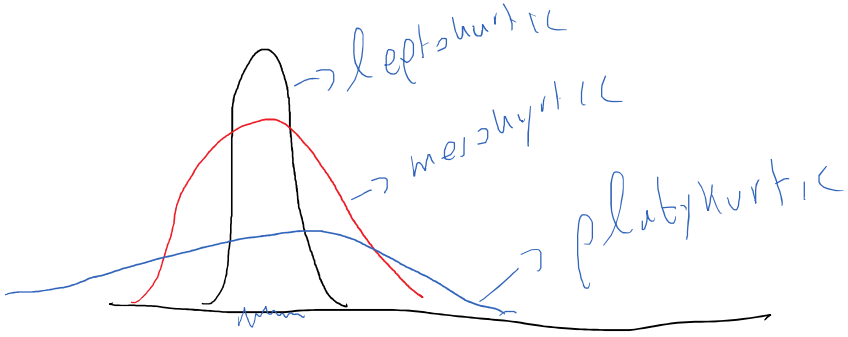
is error away from 0 for sure (is not right skewed)

$\frac{1}{2}$ s.error away from zero → close to zero

Kurtosis	
Statistic	Std. Error
-.400	.407

a_4

$a_4 - 3$



a_4 : kurtosis coefficient

book

$a_4 > 3$ leptokurtic

$a_4 \simeq 3$ mesokurtic

$a_4 < 3$ platykurtic

SPSS → PC program

$a_4 - 3$

Kurtosis > 0

Kurtosis ≃ 0

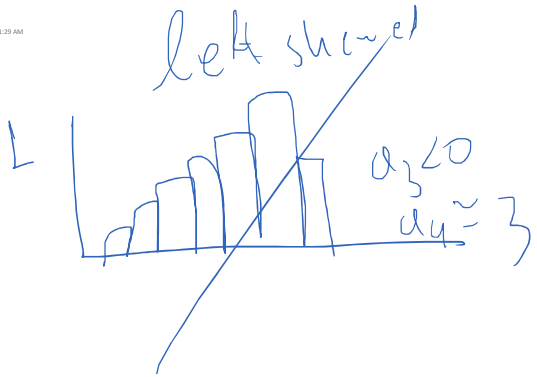
Kurtosis < 0

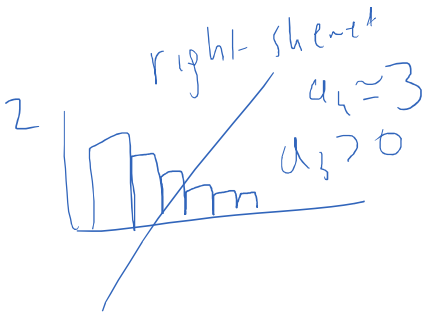
$-0.4 < 0$ → (for sure it is not leptokurtic)

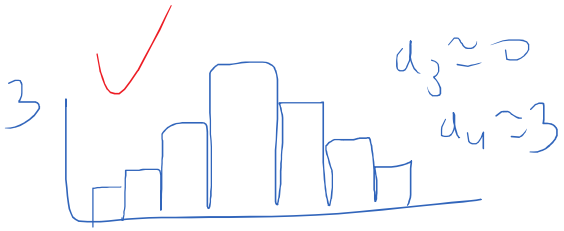
↳ S.error away from zero

↳ is not differ from zero

↳ mesokurtic







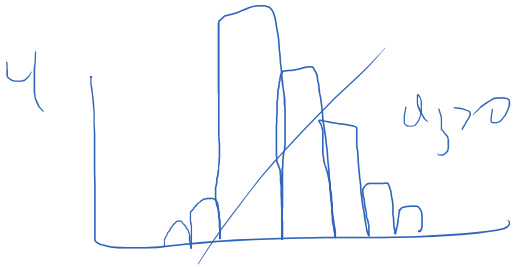
$a_4 = 2.6$

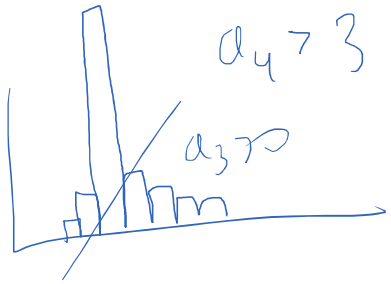
↑

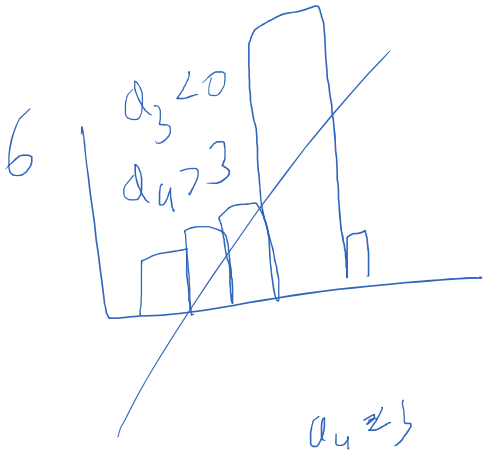
$a_4 - 3 = -0.4$

↑

Skewness		Kurtosis	
Statistic	Std. Error	Statistic	Std. Error
-.110	.205	-.400	.407

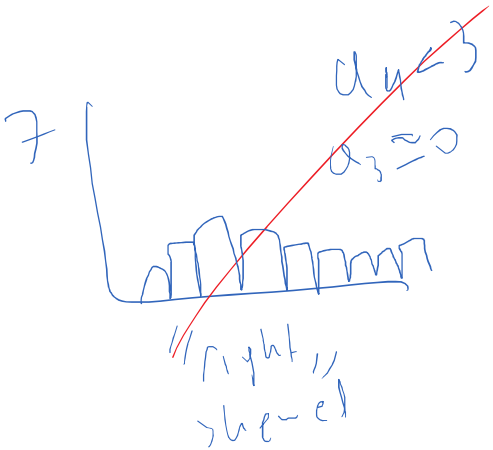


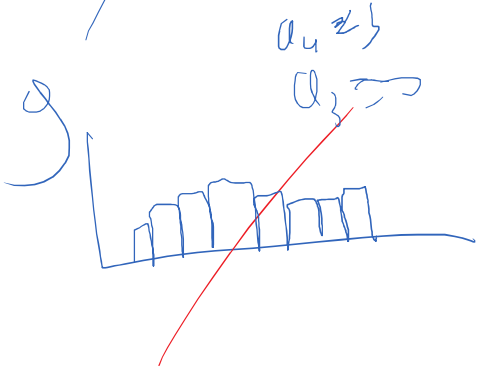


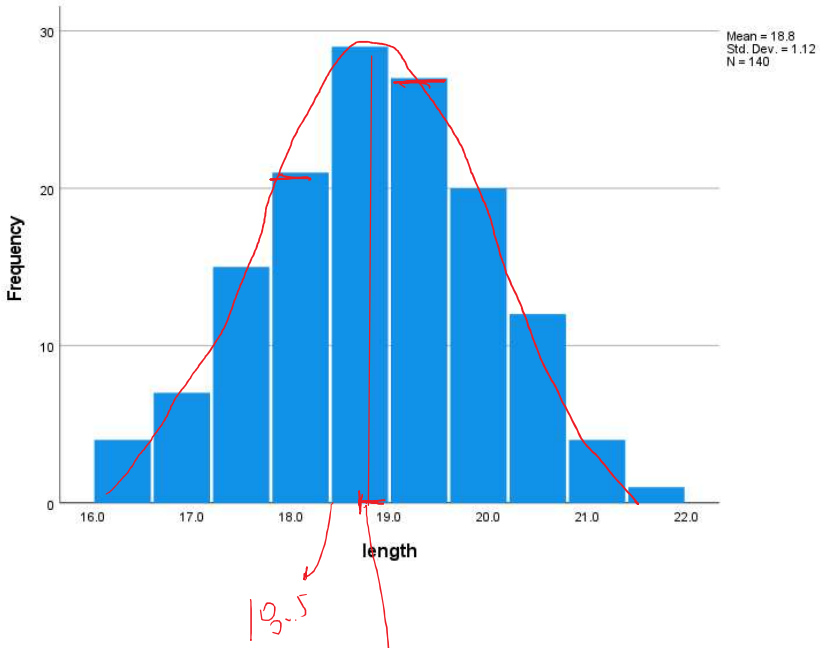


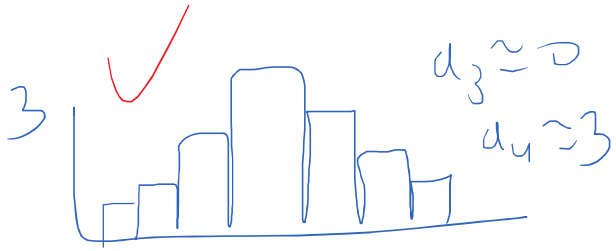
$a_3 \simeq 0$ $a_4 \simeq 3$

Symmetr mesokurtic









Skewness		Kurtosis	
Statistic	Std. Error	Statistic	Std. Error
-.110	.205	-.400	.407

18.5

mode $\in [18.5, 19.0)$

Since the frequency of the right bar > left bar

mode $\in [18.75, 19.0]$

$\bar{x} = 18.301$

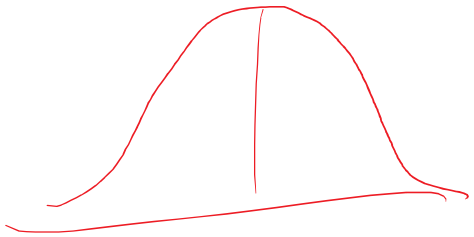
median = 18.3

mode = [18.75, 19.00]

$\bar{x} \sim$ median $\sim$ mode

$\bar{X} \simeq \text{median} \simeq \text{mode}$

$a_3 \simeq 0$



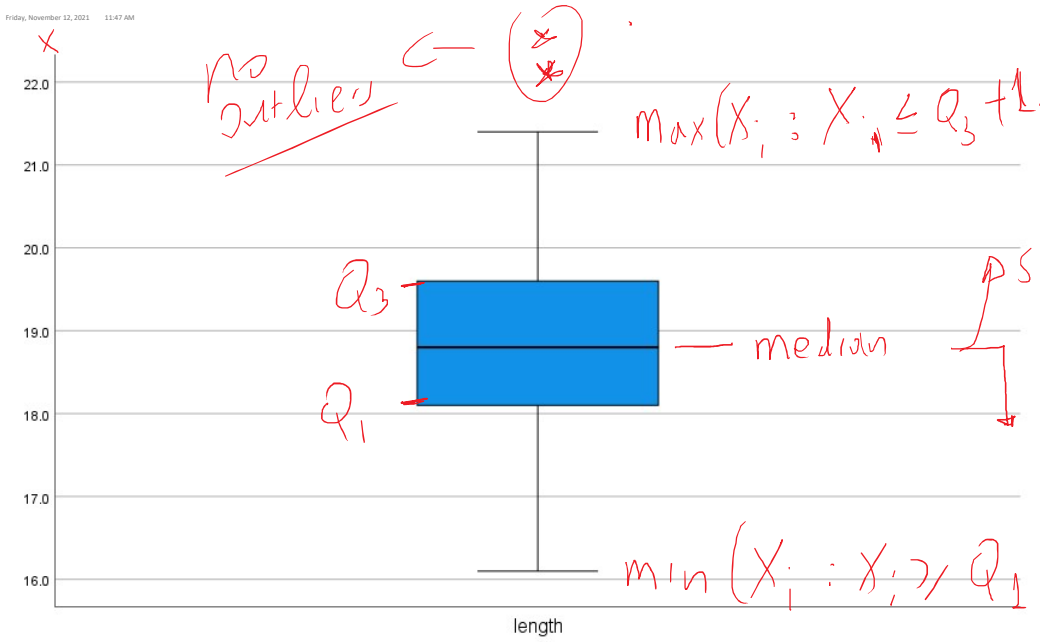
$\bar{x} \simeq \text{mode} \simeq \text{median}$

$a_3 > 0$

$\text{mode} < \text{median} < \bar{x}$

$a_3 < 0$

$\text{mode} > \text{median} > \bar{x}$



no outliers ← (*)

$\max(X_i : X_i \le Q_3 + 1.5(Q_3 - Q_1))$

Q_3

Q_1

median

50%

50%

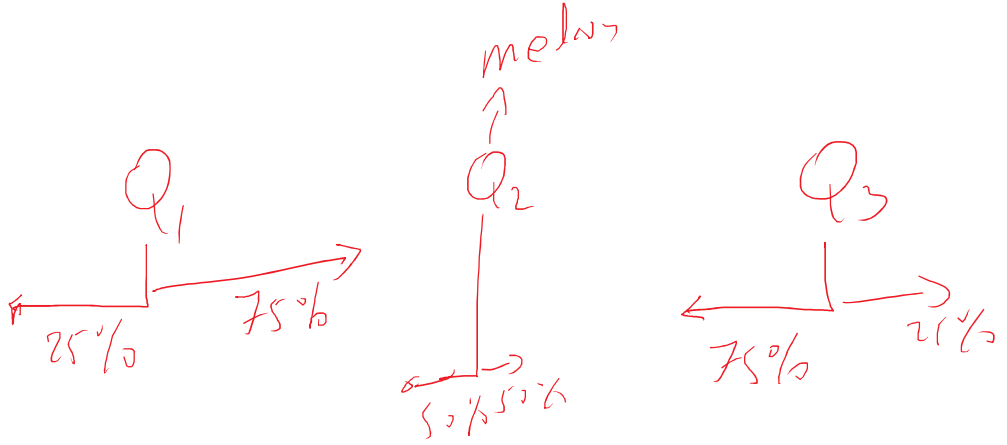
$\min(X_i : X_i \ge Q_1 - 1.5(Q_3 - Q_1))$

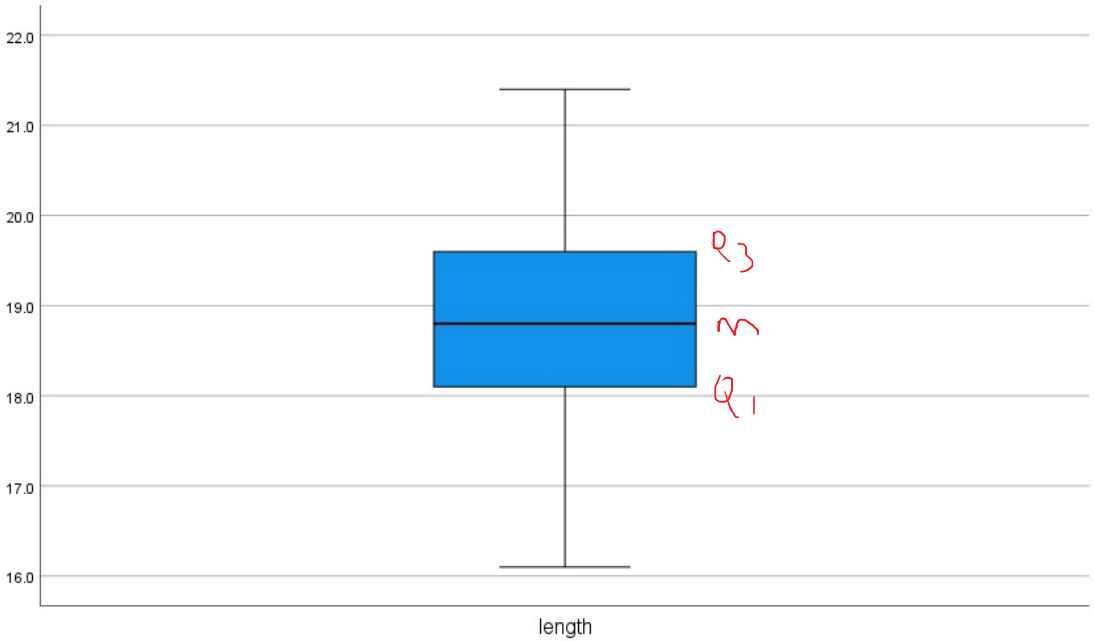
boxplot

$IQR = Q_3 - Q_1$

central 50% of the observ. belongs in $[Q_1, Q_3]$

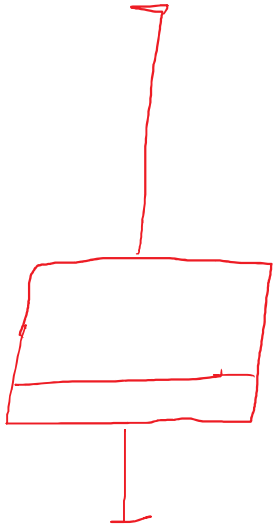
i.e. $\simeq [18.1, 19.6]$





$Q_3 - m \simeq m - Q_1$

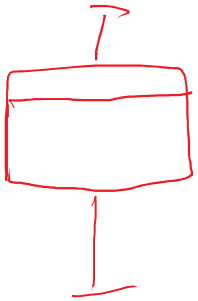
Symmetric



right skewed

$Q_3 - m > m - Q_1$

left skewed



left shear

$Q_3 - m \angle m - Q_4$