Sample Statistics

Arise from a sample (n)

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i \equiv \frac{\text{Sum(data)}}{\text{\# of data pts}}$$

$$s^2 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{(n-1)}$$

Sum of the difference squared of the data from the mean as an average across 1 less than the sample size

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

We remove the squares to correct units

Population Parameter

Arise from a population (N)

$$\mu = \frac{1}{N}\sum_{i=1}^{N} x_i \equiv \frac{\text{Sum(Pop.)}}{\text{Size of Pop.}}$$

$$\sigma^2 = \frac{\sum_{i=1}^{N}(x_i - \mu)^2}{N}$$

We cannot calculate this generally because the population is too big

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

This has the same issue

Data:	1	3	5	10	0	2	5	1	6	1	8

Organize: 0, 1, 1, 1, 2, 3, 5, 5, 6, 8, 10

Find Q_2: 0, 1, 1, 1, 2, **3**, 5, 5, 6, 8, 10 (Q_2)

Find Q_1 & Q_3: 0, 1, 1, 1, 2, 3, 5, 5, 6, 8, 10 (Q_1, Q_3)

$$IQR = Q_3 - Q_1 = 6 - 1 = 5$$

Data:	5	3	2	7	8	2	1	0

$$\bar{x} = \frac{1}{8}(5+3+2+7+8+2+1+0) = 28/8 = 3.5$$

$$s^2 = \left(\frac{1}{8-1}\right)\left((5-3.5)^2+(3-3.5)^2+(2-3.5)^2+(7-3.5)^2+(8-3.5)^2+(2-3.5)^2+(1-3.5)^2+(0-3.5)^2\right)$$

$$s^2 = 33.14/4 = 8.285$$

$$s = \sqrt{8.285} = 2.878$$

$$U = Q_3 + IQR*1.5 = 6 + 7.5 = 13.5$$

$$L = Q_1 - IQR*1.5 = 1 - 7.5 = -6.5$$