MATH FACTS

- if $X_1, X_2, ...X_n$ are iid rv's with distribution $\mathrm{N}\left\{\mu, \sigma^2\right\}$ then:

$$\bar{X} \equiv \frac{1}{n}\sum_{i=1}^{n} X_i = \hat{\mu} \sim \mathrm{N}\left\{\mu, \frac{\sigma^2}{n}\right\} \tag{1}$$

$$S^2 \equiv \frac{1}{n-1}\sum_{i=1}^{n}(X_i - \bar{X})^2 = \hat{\sigma}^2 \tag{2}$$

$$\sum_{i=1}^{n}\left(\frac{X_i - \bar{X}}{\sigma}\right)^2 \sim \text{Chi-squared}\{n-1\} \tag{3}$$

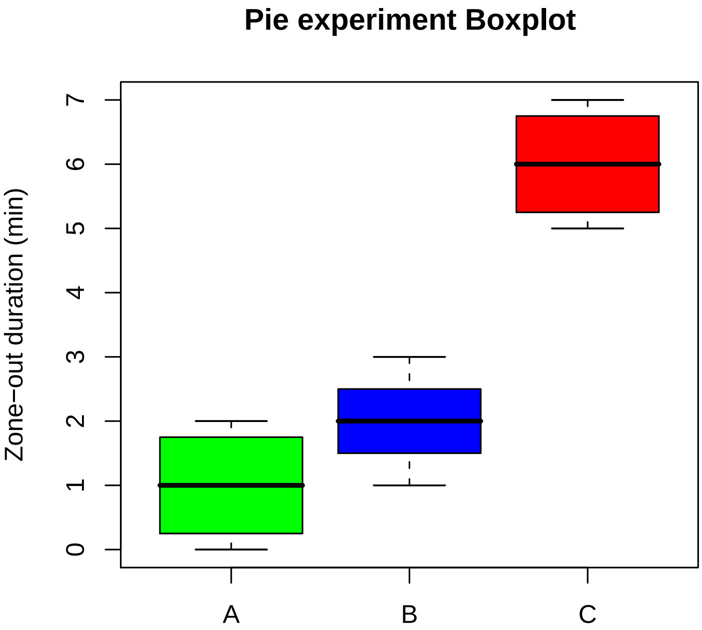
- if $Y_1, Y_2, ...Y_n$ and $Z_1, Z_2, ...Z_m$ are iid rv's with distribution $\mathrm{N}\{0, 1\}$ then:

$$\frac{\frac{1}{m}\sum_{i=1}^{m} Z_i^2}{\frac{1}{n}\sum_{i=1}^{n} Y_i^2} \sim \mathrm{F}\{m, n\} \tag{4}$$

- **Cochran's Theorem**: If Z_i are iid $\mathrm{N}\{0, 1\}$ for $i = 1, 2, ..., \nu$ AND

$$\sum_{i=1}^{\nu} Z_i^2 = Q_1 + Q_2 + ... + Q_s \tag{5}$$

where Q_i is the sum of ν_i squared random variables AND $\nu = \nu_1 + \nu_2 + ... + \nu_s$, THEN, $Q_1, Q_2, ..., Q_s$ are independent chi-squared random variables with $\nu_1, \nu_2, ..., \nu_s$ degrees of freedom.


Pie experiment Boxplot
Zone−out duration (min)
0
1
2
3
4
5
6
7
A
B
C