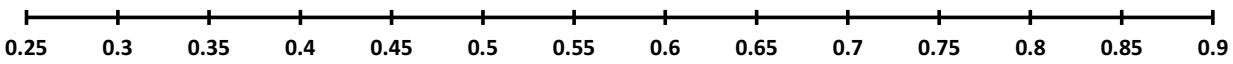
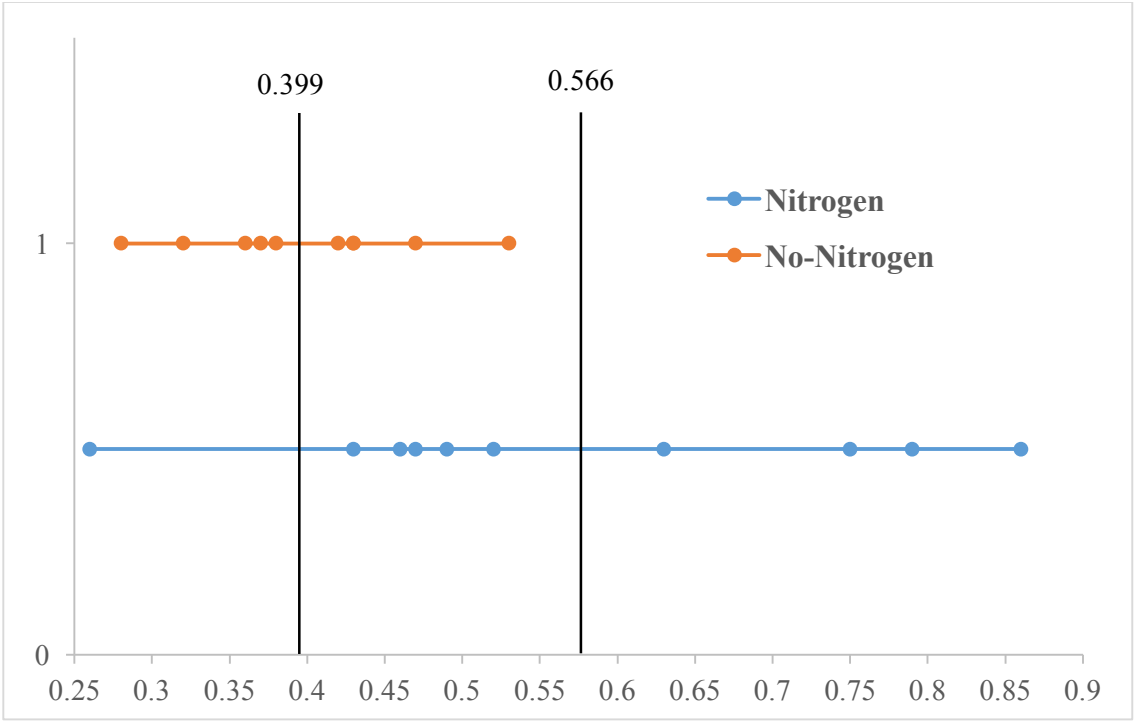
Tutorial 1 (Introduction to Probability and Statistics):

Two samples of 10 northern red oak seedlings were planted in a greenhouse, one containing seedlings treated with nitrogen and the other containing seedlings with no nitrogen. All other experimental conditions were held constant. The stem weights, in grams, at the end of 140 days were recorded as follows:

No Nitrogen	Nitrogen
0.32	0.26
0.53	0.43
0.28	0.47
0.37	0.49
0.47	0.52
0.43	0.75
0.36	0.79
0.42	0.86
0.38	0.62
0.43	0.46

(1) Present the data by the way of a dot plot.
(2) Calculate the mean weight for both sample. Show the mean values on the dot plot.
(3) Does the dot plot suggest that nitrogen has any effect on the weight?
(4) Calculate the standard deviation of the both samples. Compare the two standard deviations. Interpret the standard deviations.
(5) Calculate the mode and median for the two samples.





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Mean	**0.399**	**0.566**
Variance	**0.005**	**0.03**
Mode	**0.43**	**NA**
Median	**(0.38+0.42)/2 = 0.40**	**(0.49+0.52)/2=0.51**

Formula:

Suppose that the observations in a sample are $x_1, x_2, \ldots, x_n$. The **sample mean**, denoted by $\bar{x}$, is

$$\bar{x} = \sum_{i=1}^{n} \frac{x_i}{n} = \frac{x_1 + x_2 + \cdots + x_n}{n}.$$

Given that the observations in a sample are $x_1, x_2, \ldots, x_n$, arranged in **increasing order** of magnitude, the sample median is

$$\tilde{x} = \begin{cases} x_{(n+1)/2}, & \text{if } n \text{ is odd,} \\ \frac{1}{2}(x_{n/2} + x_{n/2+1}), & \text{if } n \text{ is even.} \end{cases}$$

The **sample variance**, denoted by s^2, is given by

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

The **sample standard deviation**, denoted by s, is the positive square root of s^2, that is,

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