Research

is about asking and answering questions

Trying to extend our knowledge or make decisions

- Improve a process or technology
- Mass produce new chemicals
- Testing drugs
- Designing computer circuits
- Choose new materials
- Machine new parts

This process requires

Data

But what kind of data?

What do we do with the data when we get it?

Statistics:

A tool for helping us do Research

We need to be sure we:

- **Collect the right kind of data,**
- **Collect the data properly,**
- **Make sure we actually get the data we intended, and….**
- **Know the right "*statistics*" to use!**

Mean, Median, Mode
Standard deviation, Standard error
Normal Distribution, Z-scores
t-tests
p-values
Anova
correlation
regression

$\Sigma\ \mu\ \sigma\ s\ \rho\ \alpha\ \beta\ \chi\ \varepsilon\ \varpi\ n\ N$

Descriptive Statistics

vs.

Inferential Statistics

Hypothesis Testing

- Research Question
  - Null and Alternative hypothesis
- Type of Test?
- Significance level
- Test statistic (critical value)
- Observed value (from sample)
- Statistical decision
- Conclusion

Normal Distribution

- **Mean +/ - 3 SD**
- **Mean, Median, Mode**
- **Standard Deviation**

Mean

$$\bar{x} = \Sigma x / n$$

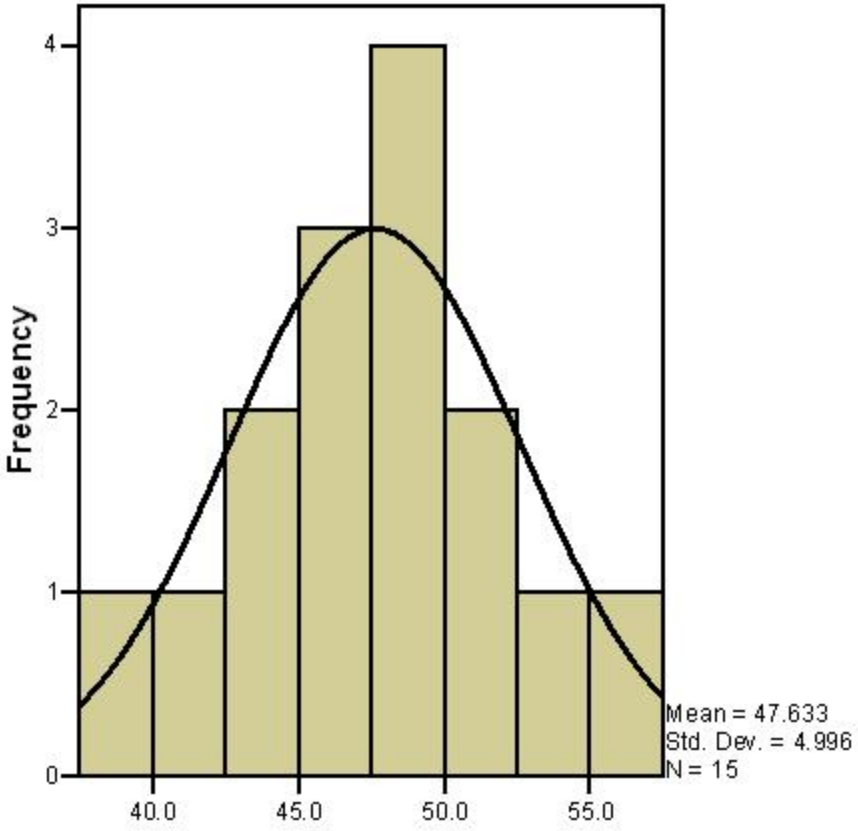
Median

Mode

Standard Deviation

$$S^2 = \frac{\Sigma (x - \mu)^2}{n-1}$$

$$\text{----->} \quad \Sigma x^2 - \frac{(\Sigma x)^2}{n}$$


Frequency
4
3
2
1
0
40.0
45.0
50.0
55.0
Mean = 47.633
Std. Dev. = 4.996
N = 15