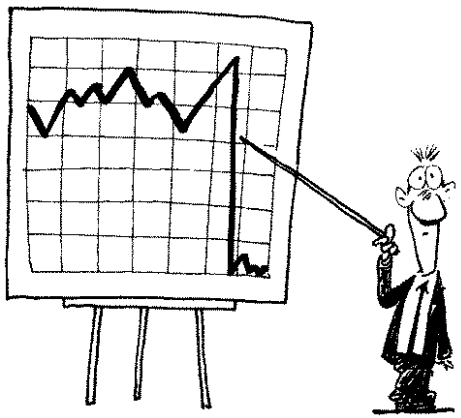
Continuous Improvement Toolkit

Graphical Analysis


Managing Risk
PDPC
FMEA
RAID Logs
Fault Tree Analysis
Risk Assessment*
Traffic Light Assessment
Deciding & Selecting
Pros and Cons
Importance-Urgency Mapping
Break-even Analysis
Cost -Benefit Analysis
Force Field Analysis
Voting
Pugh Matrix
Decision Tree
TPN Analysis
QFD
Matrix Diagram
Kano Analysis
Prioritization Matrix
Critical-to Tree
Paired Comparison
Planning & Project Management*
RACI Matrix
Stakeholders Analysis
PEST
PERT/CPM
Activity Diagram
SWOT
Roadmaps
Project Charter
Gantt Chart
PDCA
Control Planning
Gap Analysis
Hoshin Kanri
Kaizen
How-How Diagram
Tree Diagram**
Standard work
Lean Measures
KPIs
OEE
Capability Indices
MSA
RTY
Descriptive Statistics
Cost of Quality
Reliability Analysis
Cause & Effect Matrix
Pareto Analysis
Confidence Intervals
Understanding Cause & Effect
Probability Distributions
ANOVA
Graphical Analysis
Hypothesis Testing
Design of Experiments
Scatter Plot
Correlation
Regression
Multi-Vari Charts
5 Whys
Chi-Square Test
Relations Mapping*
Fishbone Diagram
TRIZ***
Identifying & Implementing Solutions***
Simulation
TPM
Mistake Proofing
Pull Systems
JIT
Ergonomics
Work Balancing
Automation
Bottleneck Analysis
Visual Management
Flow
Value Analysis
5S
Wastes Analysis
SMED
Time Value Map
Process Redesign
IDEF0
Value Stream Mapping
SIPOC
Flow Process Chart
Process Mapping
Flowcharting
Service Blueprints
Designing & Analyzing Processes
Understanding Performance
Run Charts
Control Charts
Benchmarking
Sampling
Focus groups
Interviews
Photography
Check Sheets
Measles Charts
Surveys
Data Collection
Critical Incident Technique
Observations
Brainstorming
Analogy
SCAMPER***
Nominal Group Technique
Mind Mapping*
Affinity Diagram
Attribute Analysis
Lateral Thinking
Visioning
Creating Ideas**

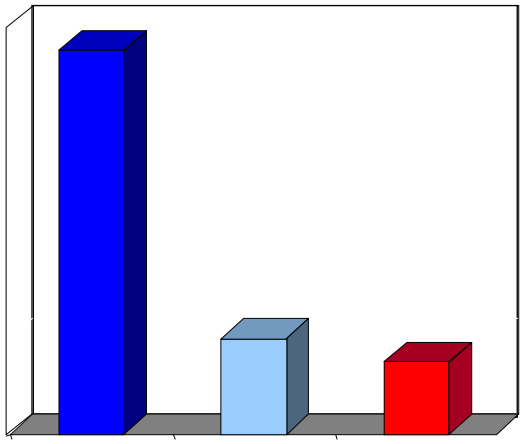
- Graphical Analysis

- Statistic is the science of describing, interpreting and analyzing data.
- **Statistics Types:**
  - **Graphical Statistics:**
    Makes the numbers visible.
  - **Inferential Statistics:**
    Makes inferences about populations from sample data.
  - **Analytical Statistics:**
    Uses math to model and predict variation.
  - **Descriptive Statistics:**
    Describes characteristics of the data (central tendency, spread)



- Graphical Analysis

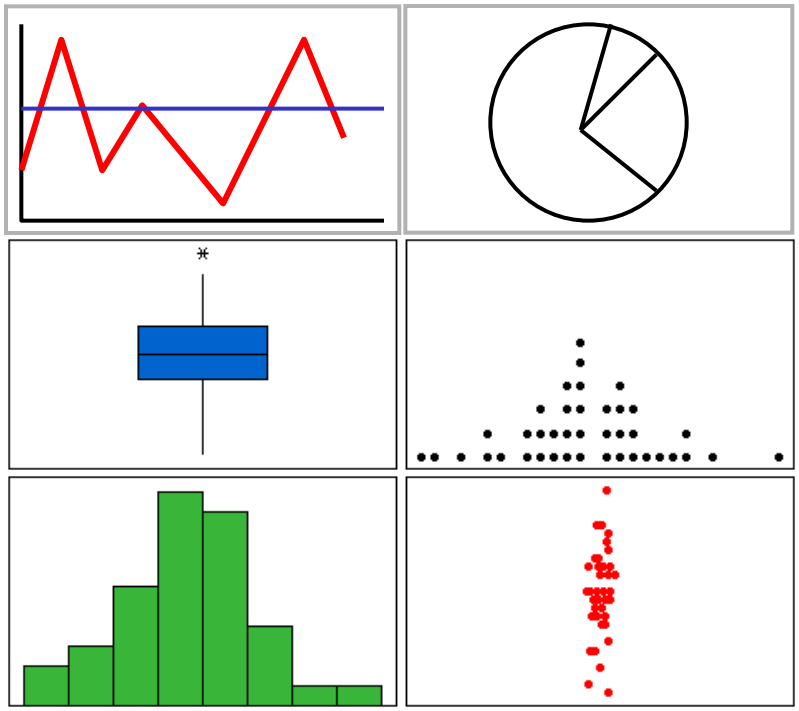
- A long list of numbers is usually not practical for conveying information.
- One of the best ways to understand a process is to graph the data.
- They are the starting point for the data door.
- Theories and ideas gained from the graphical analysis can then be investigated with more advanced statistical techniques.



"Graphs truly show that a picture is worth a thousand of words"

- Graphical Analysis

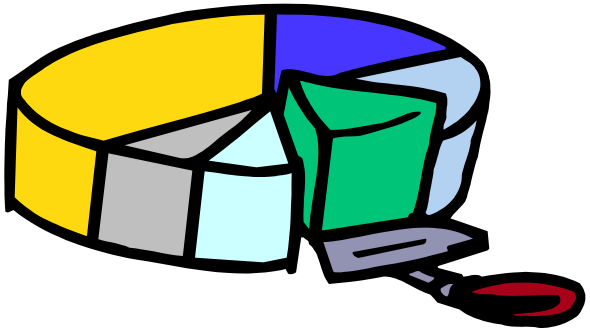
- Different graphs can emphasize different characteristics of the same data.



- Graphical Analysis

Pie Charts:

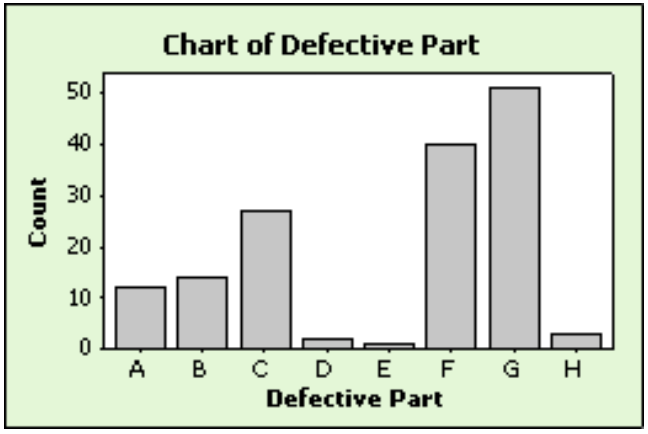
- Pie Charts are used when we need to display the relative frequency of categorical data.
- They display the proportion of each category relative to the whole.

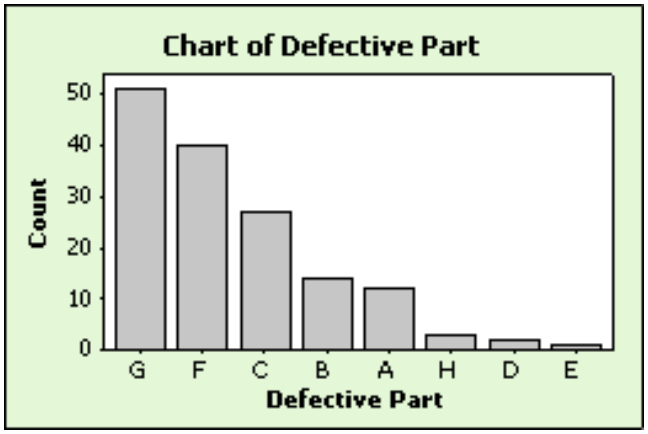


- Graphical Analysis

Bar Charts:

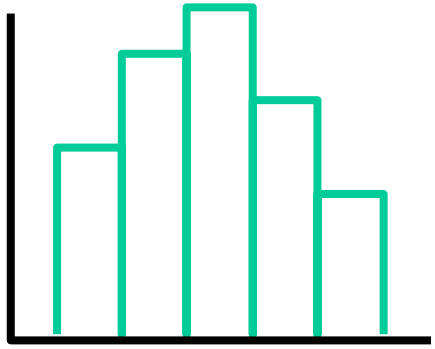
- **Bar Charts** and **Pareto Charts** are used to illustrate the frequencies of categorical data.
- A Bar Chart displays the frequency of each category.
- A Pareto Chart is a bar chart that shows the categories in descending order of frequency.
- It is used to identify the largest opportunity for quality improvement.





- Graphical Analysis

Histograms:

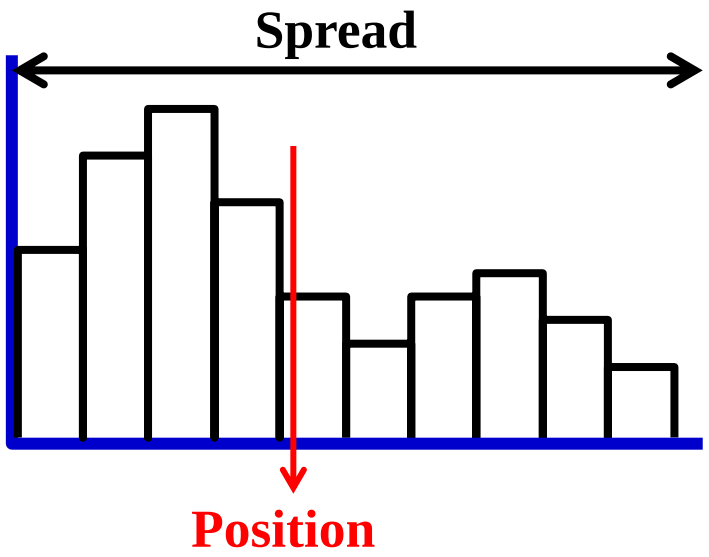


- Sometimes a bar char is used to display numeric data.
- Histograms are efficient graphical methods for describing the distribution of data.
- The horizontal axis represents the scale of the data which is divided into intervals (bins) of equal size.
- Each bar represents the frequency of data values that occur in each interval.

- Graphical Analysis

Histograms are used to assess:

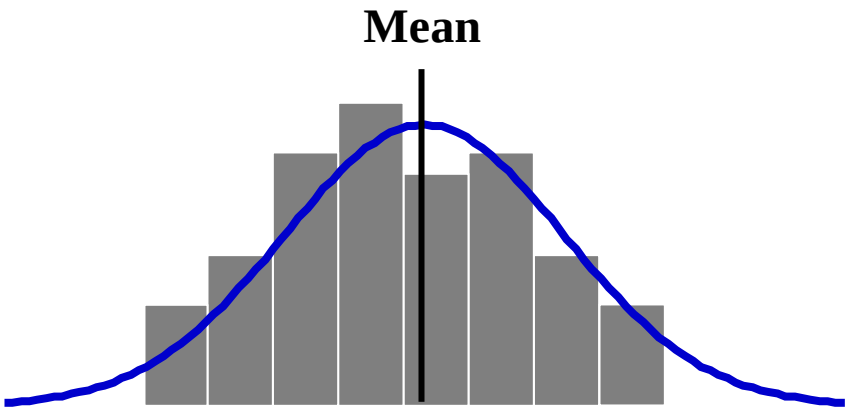
- Measure of central tendency.
- Variation in data.
- Normality.



- Graphical Analysis

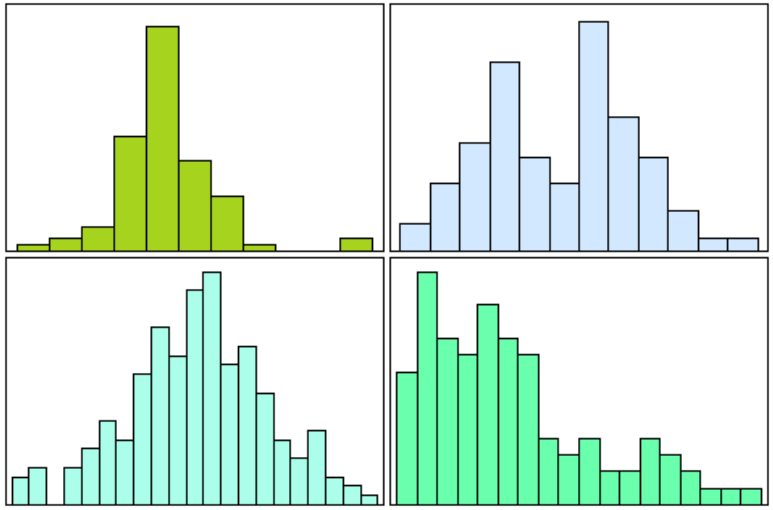
Histograms:

- Histograms display moderate to large amount of numeric data.
- The minimum sample size for a Histogram is 25.
- **Normal distribution is the case when the data is:**
  - Symmetrically distributed.
  - Centered at the mean.



- Graphical Analysis

Histograms:



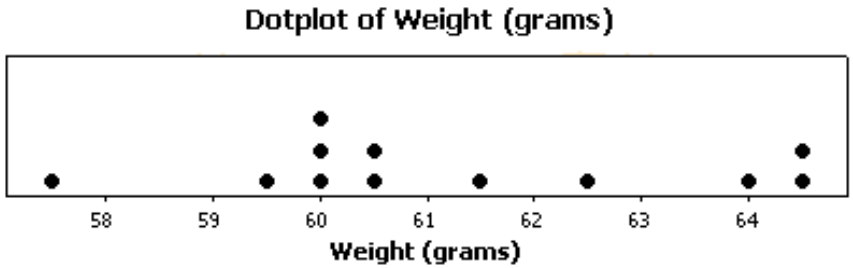
Normal | *Weibull* | *Poisson* | *F*

Binomial | *Student's T* | *Exponential* | *Uniform*

- Graphical Analysis

Dotplots:

- Useful for displaying small to moderate amount of numeric data.
- They show where the data are clustered.

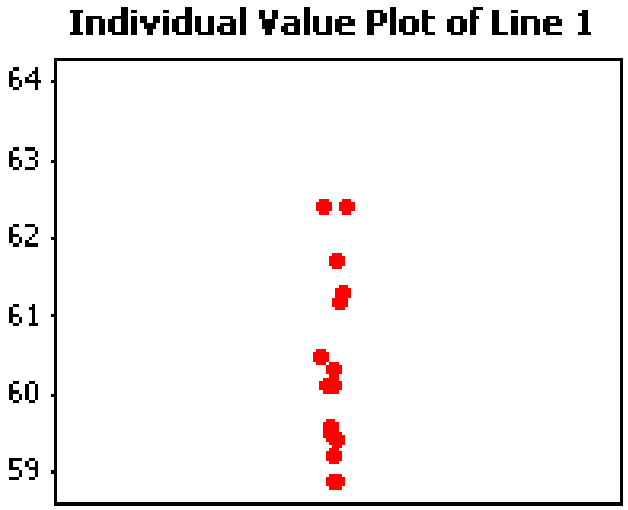


- They show one data point for every data point, and can help identify any unusual.
- They provide details about the individual data points while histograms groups data values to better reveal the overall shape of the distribution.

- Graphical Analysis

Individual Value Plots:

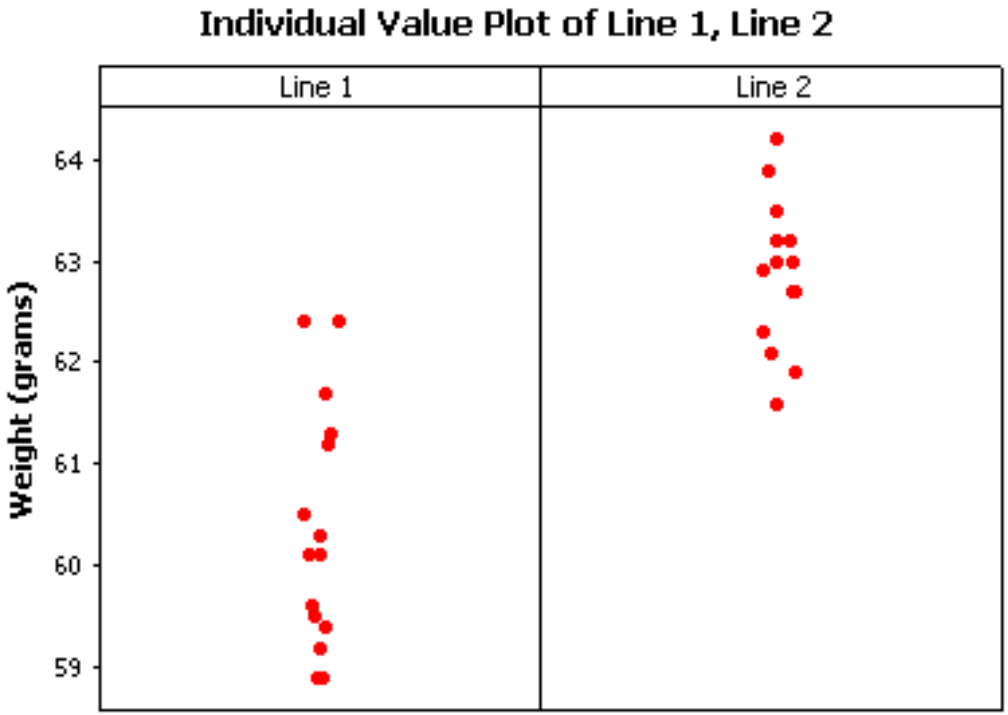
- Display the individual data points for a single variable or a group of numeric variables.
- The points allow us to see all the individual values even if they are same or very close to each other.
- They are also useful to compare populations.



- Graphical Analysis

Individual Value Plots:

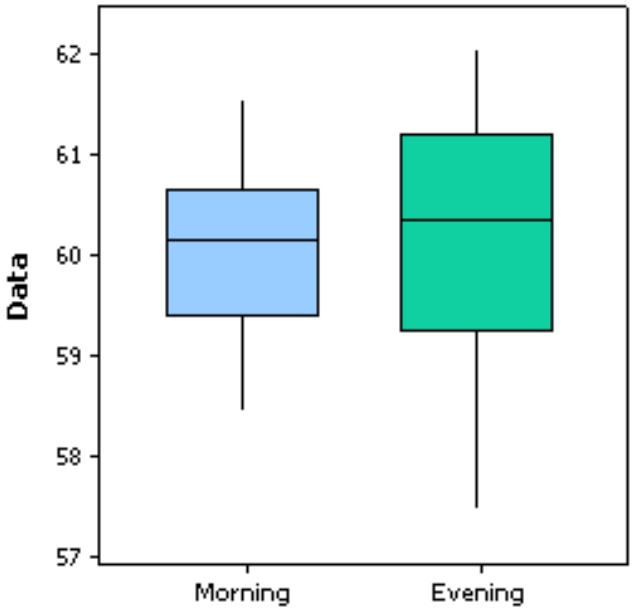
- What can you conclude about this Individual Value Plot?



- Graphical Analysis

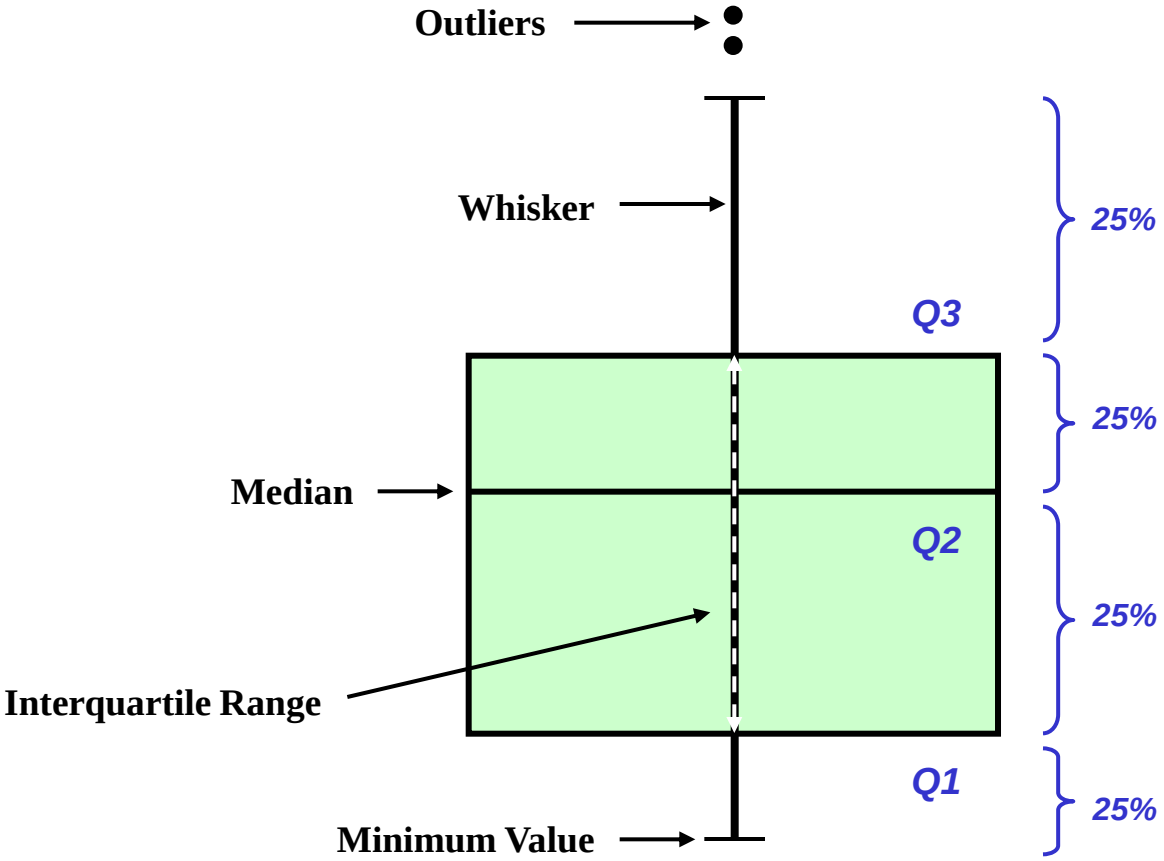
Boxplots:

- Like histograms, work better with moderate and large sample sizes.
- They summarize important aspects of the distribution of numeric data.
- Like Individual Value Plots, they help compare multiple samples of data.
- If the values have a wider range, this indicate more variability.
- They display quartile information.



- Graphical Analysis

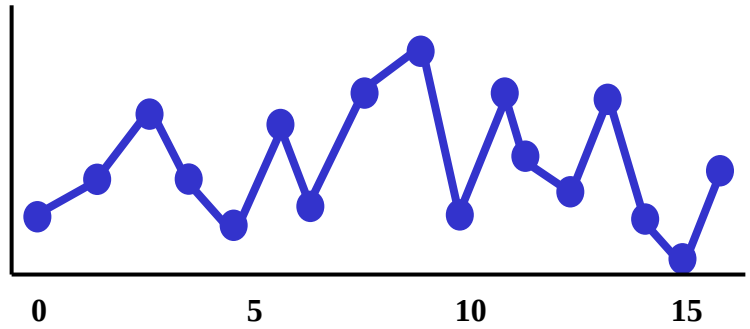
Boxplots:



- Graphical Analysis

Time Series Plots:

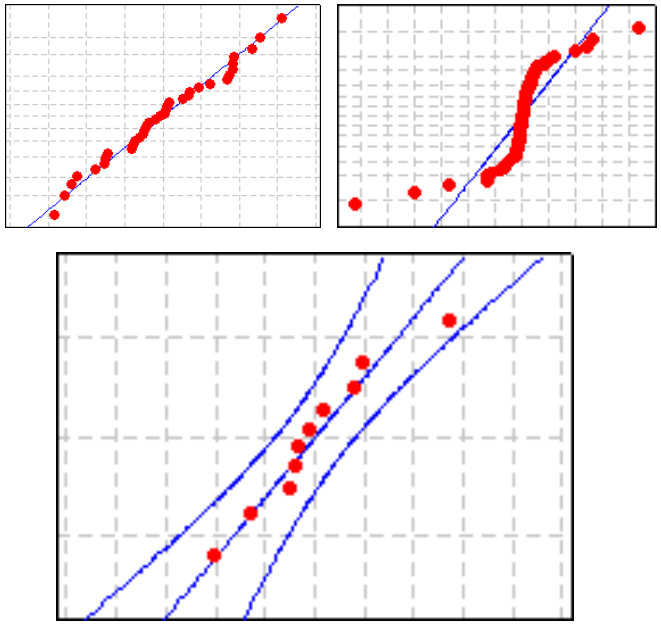
- Help to spot changes and trends overtime.
- Require the data to be in the order that actually happened.
- **Things to look out for:**
  - Changes in the amount of variation.
  - Upward and downward trends.
  - Patterns and cycles.
  - Anything not random.
- **More advanced charts:**
  - Run charts.
  - Control charts.



- Graphical Analysis

Probability Plots:

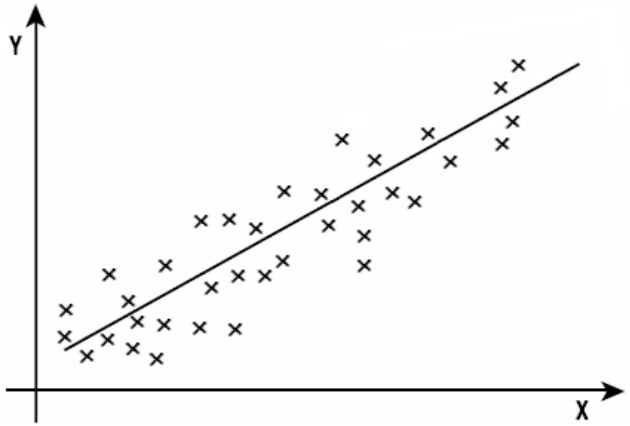
- Provide a more decisive approach for deciding if a data set fits the normal distribution.
- Constructed in a way that the points will fall in a straight line if they fit the distribution question (e.g. Normal).
- A Normal distribution will form a straight line that falls between the 95% the CI limits.



Normal Probability Plots

- Graphical Analysis

Scatter Plots:



- Used to study the relationship between two variables.
- Numerous problems encountered in quality require the estimation of relationships between two or more variables.
- Used to determine what happens to one variable when another variable changes value.
- It shows patterns in the relationship that we could not see by just looking at the data.

- Graphical Analysis