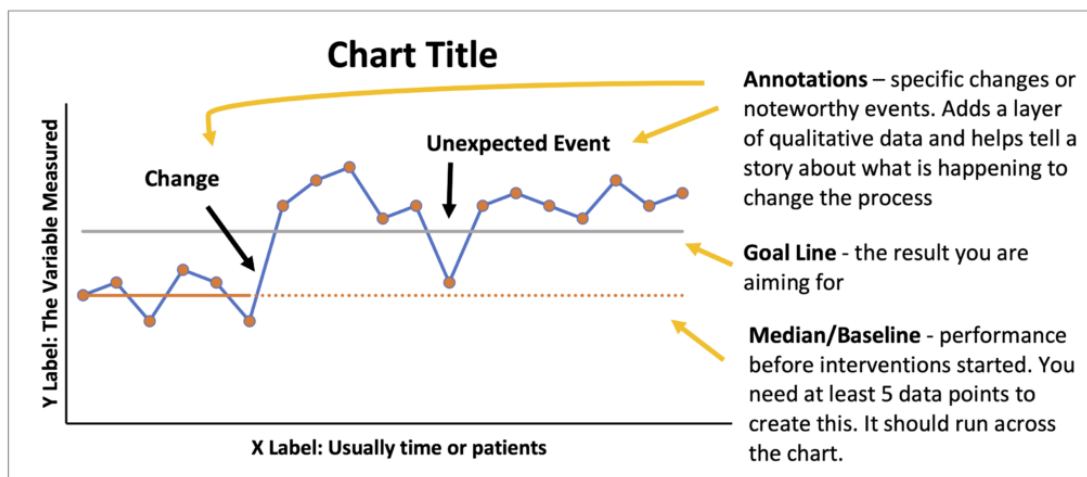# Study Guide: Run Charts

This course will provide a basic understanding of Run Charts and how to use them for Continuous Improvement.

What is a Run Chart?

A Run Chart is a data display tool that is used in all stages of improvement, especially in the Continuous Improvement phase.
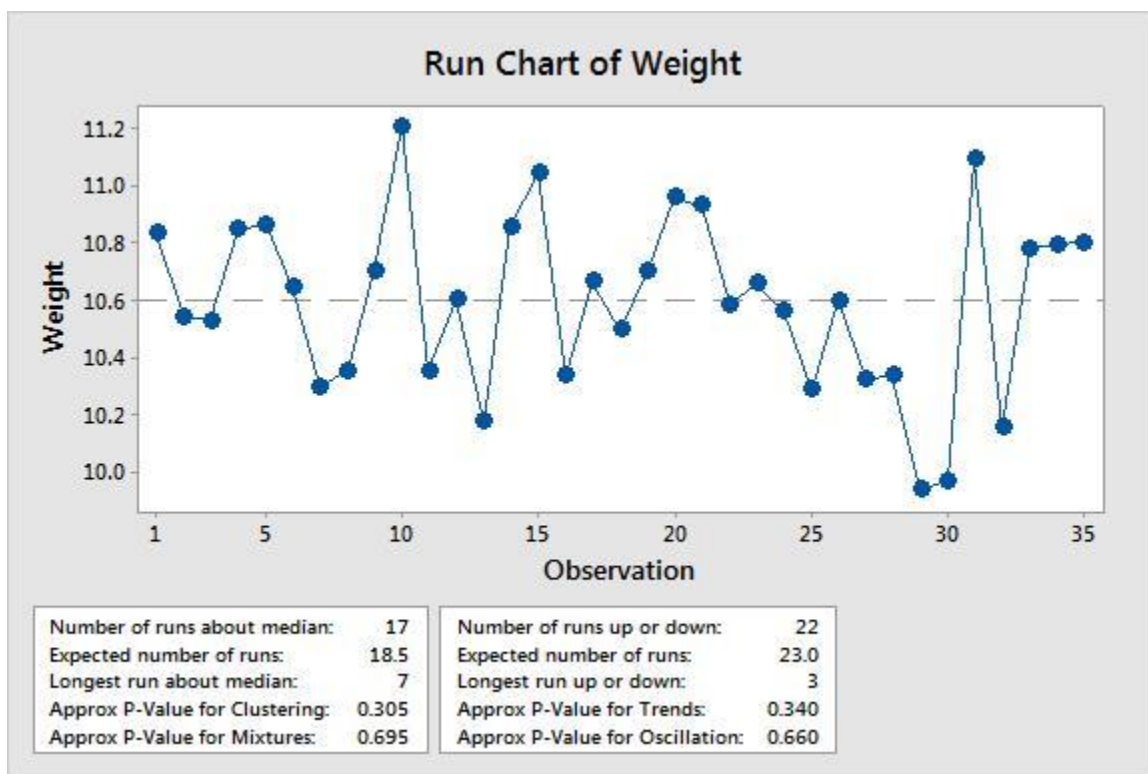
A Run Chart shows data over time that makes it easy to see the following:

- Trends in data
- Point-to-point variation
- Spread of data
- Impact of changes made over time

A run chart has time on the x-axis. This could be measured in hours, days, weeks, months, years, etc. The y-axis plots the measure of interest. The goal line shows the target condition for the process.

The median is represented by the centerline on the chart. The median will have half of the datapoints on one side and other half on the other side.

A median should take into account at least 8 datapoints.

Run Chart of Weight

Number of runs about median:	17	Number of runs up or down:	22
Expected number of runs:	18.5	Expected number of runs:	23.0
Longest run about median:	7	Longest run up or down:	3
Approx P-Value for Clustering:	0.305	Approx P-Value for Trends:	0.340
Approx P-Value for Mixtures:	0.695	Approx P-Value for Oscillation:	0.660

Common cause variation is **the kind of variation that is part of a stable process**. These are variations that are natural to a system and are quantifiable and expected. Common cause variations are those that are predictable, ongoing, and consistent.

A "shift" in the data is a signal for special cause variation. Special cause variation is **caused by a non-random and non-quantifiable conditions impacting the process.**
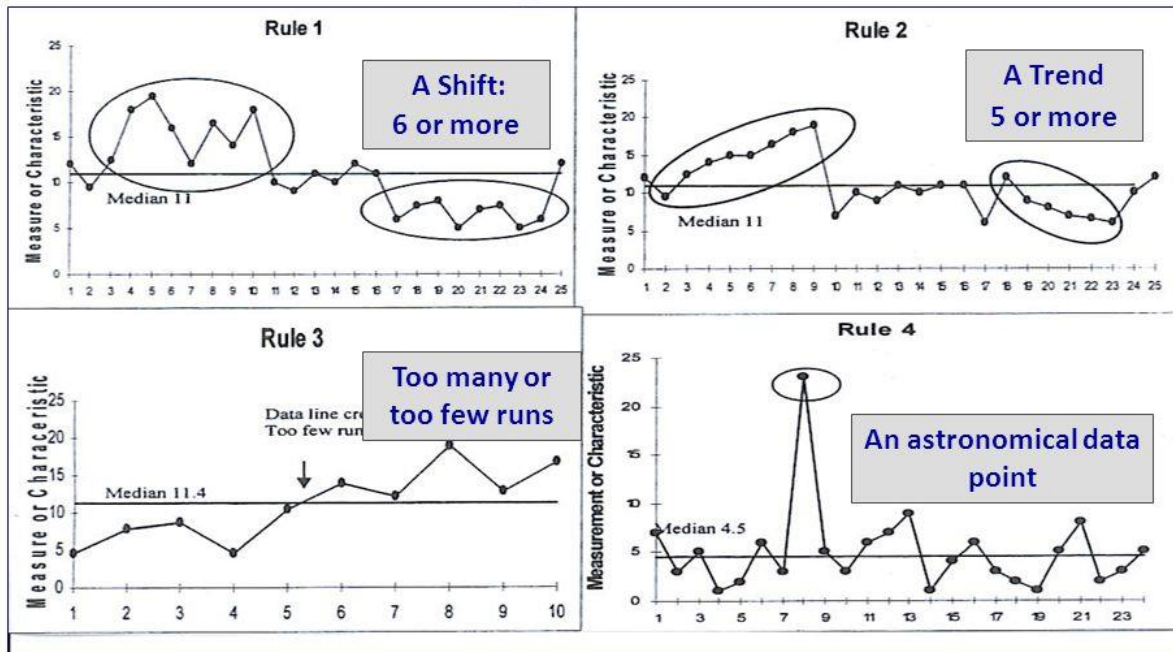
Run Chart with a Shift
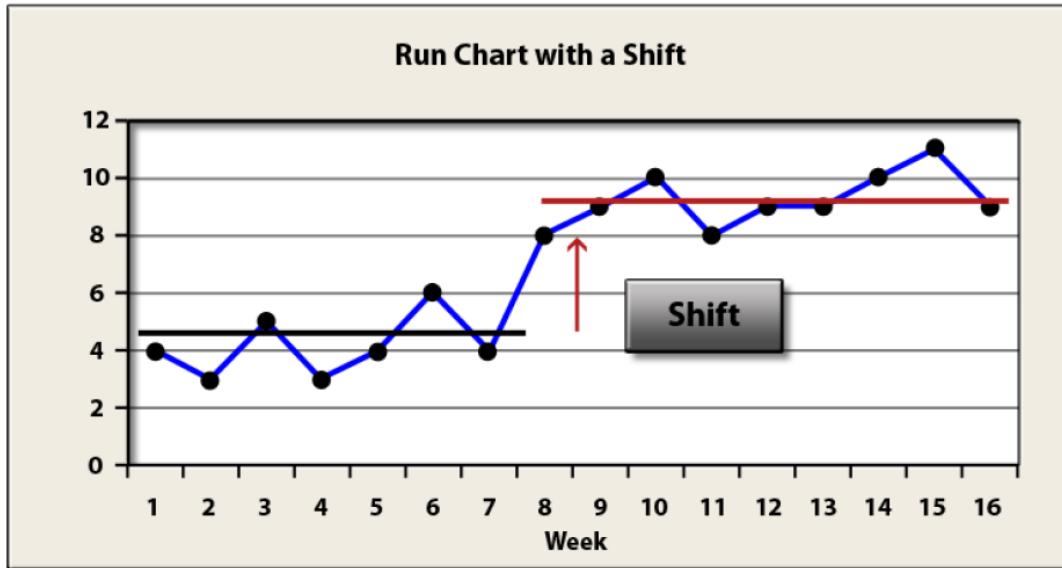
Benefits of using Run Charts

- Measure performance
- Make data-guided decisions
- See the impact of testing (changes)
- Guide improvement work

Rules for Special Cause Variation

There are four rules for analyzing special cause variation.

Non-Random Signals on Run Charts

Evidence of a non-random signal if one or more of the circumstances depicted by these four rules are on the run chart. The first three rules are violations of random patterns and are based on a probability of less than 5% chance of occurring just by chance with no change.

The Data Guide, p 3-11

If there are eight datapoints on one side of the centerline, this represents a **shift** in the system. If one data point falls directly on the centerline, ignore that datapoint in your count. A new centerline is calculated using the last eight datapoints.

If there are six or more datapoints showing a continuous increase or decrease, this is called a **trend** and its causes should be investigated. This is not likely to be a random occurrence.

If you observe a **zig zag pattern** on a Run Chart for 14 or more points, this indicates two systems alternating systems being observed (ie day shift and night shift). In this case, separate the data from the two systems into two charts and analyze from there.

An **astronomical data point** is an extreme value that may need further investigation and annotation.
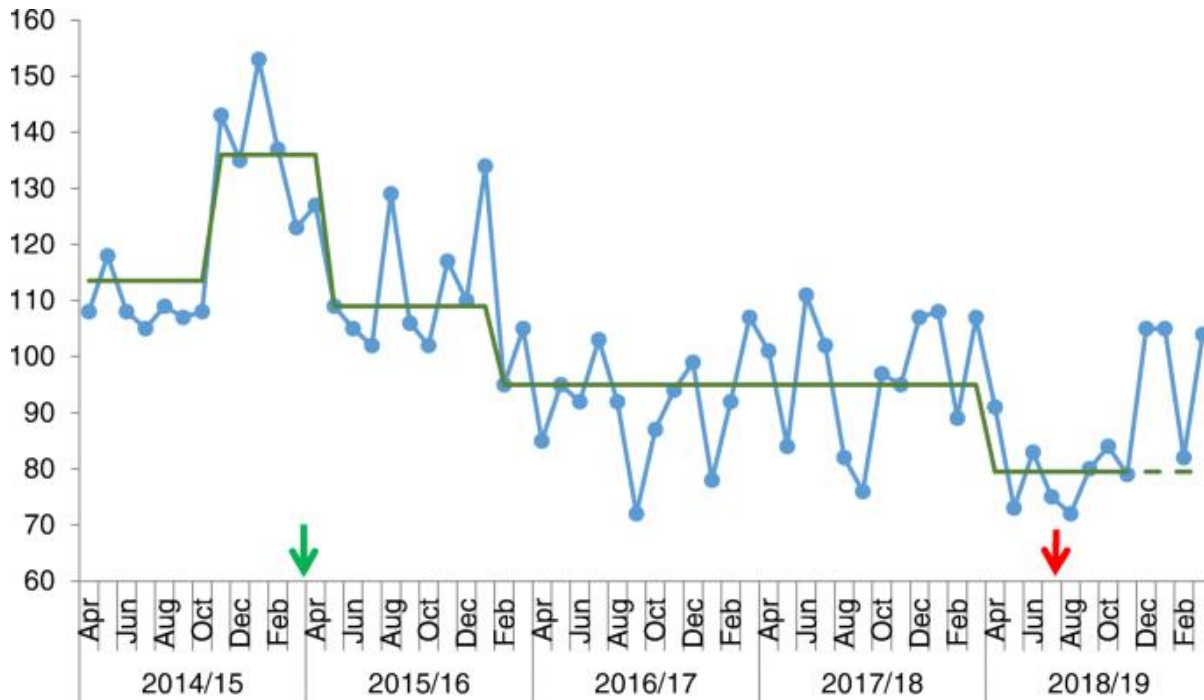
Advantages of using a Run Chart

- Easy to build and understand
- Can use any type of data (variable)
- Can start a Run Chart even with a few data points
- A Run Chart with annotations can tell a project story in one snap