

Control Charts

- A JIT on-line process tool
- Detects assignable causes
- Shows “inherent” variation of the process
- Looks @ “controllable” parameters
- Shows the capability of the process

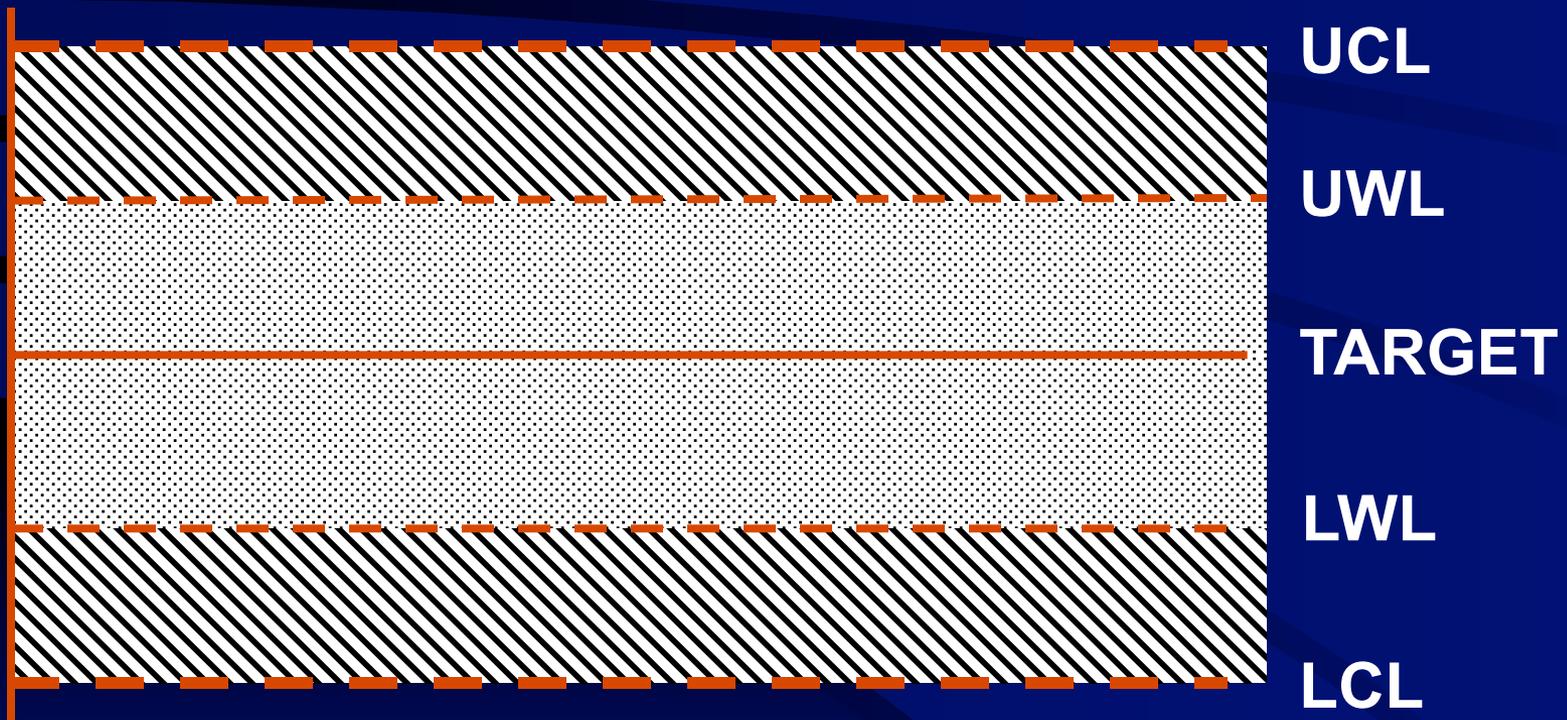
Control Charts

- Used to reduce variability
- Used to determine process capability
- Prevents system tampering
- Provides diagnostic information
- Tells what the process is doing NOW and has done in the past
- Used to predict the future

Control Charts

- Technicians use control charts “hourly”, everyday to keep track of what the process “is doing”.
- Engineers used control charts periodically to see what the process “has done”, the estimate what the process is “capable” of doing.

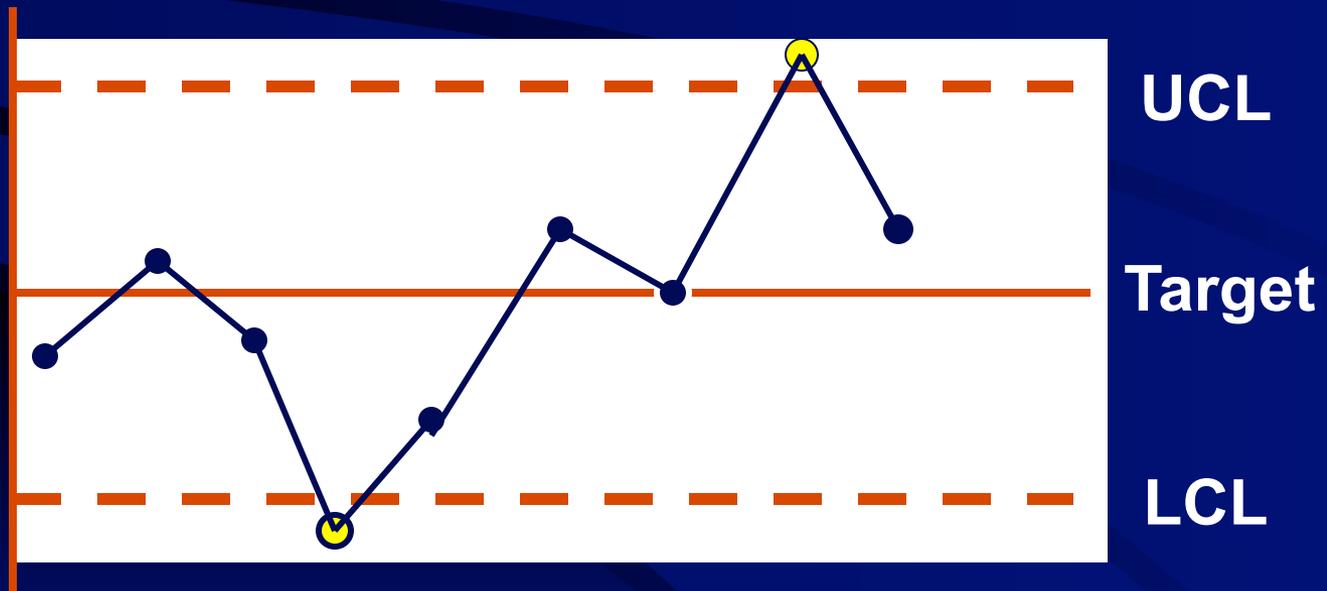
Control Charts



Western Electric Rules

Rule 1:

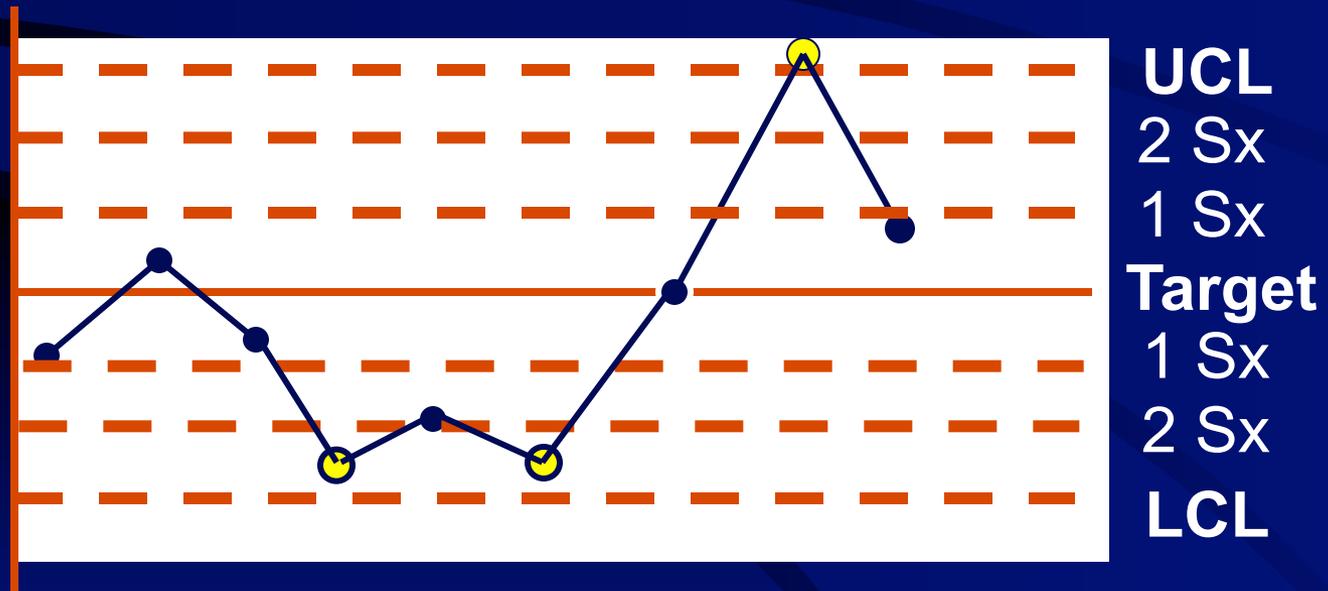
One point outside the UCL or LCL.



Western Electric Rules

Rule 2:

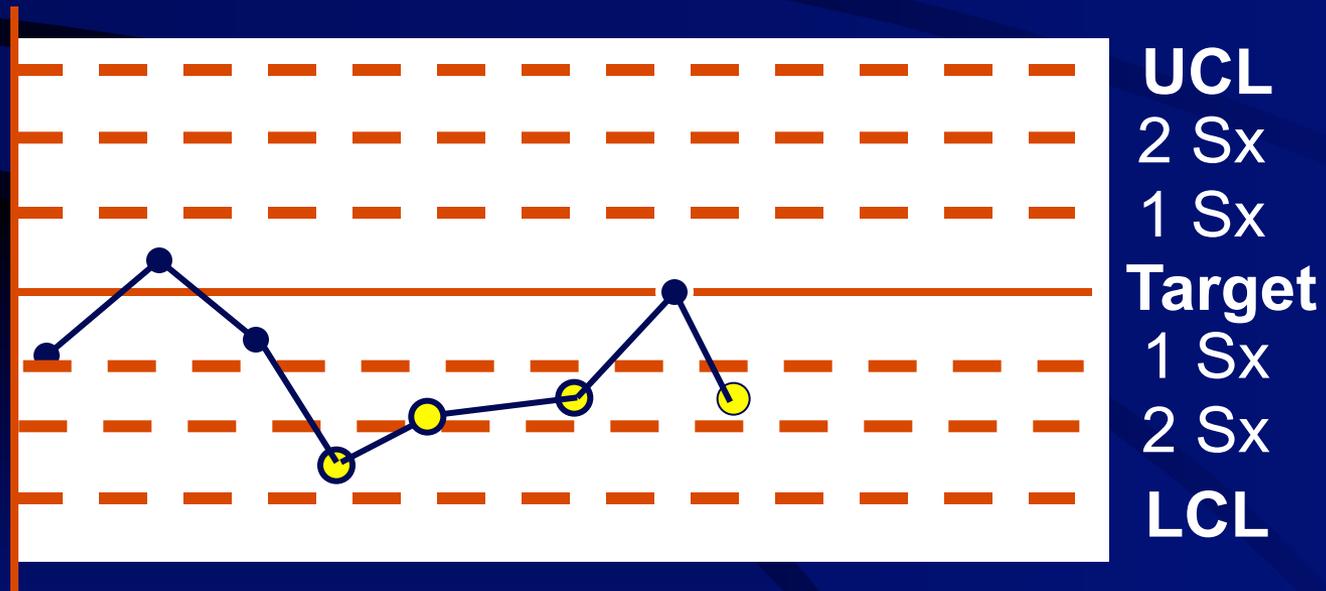
2 of 3 consecutive points between 2 and 3 S_x from the target.



Western Electric Rules

Rule 3:

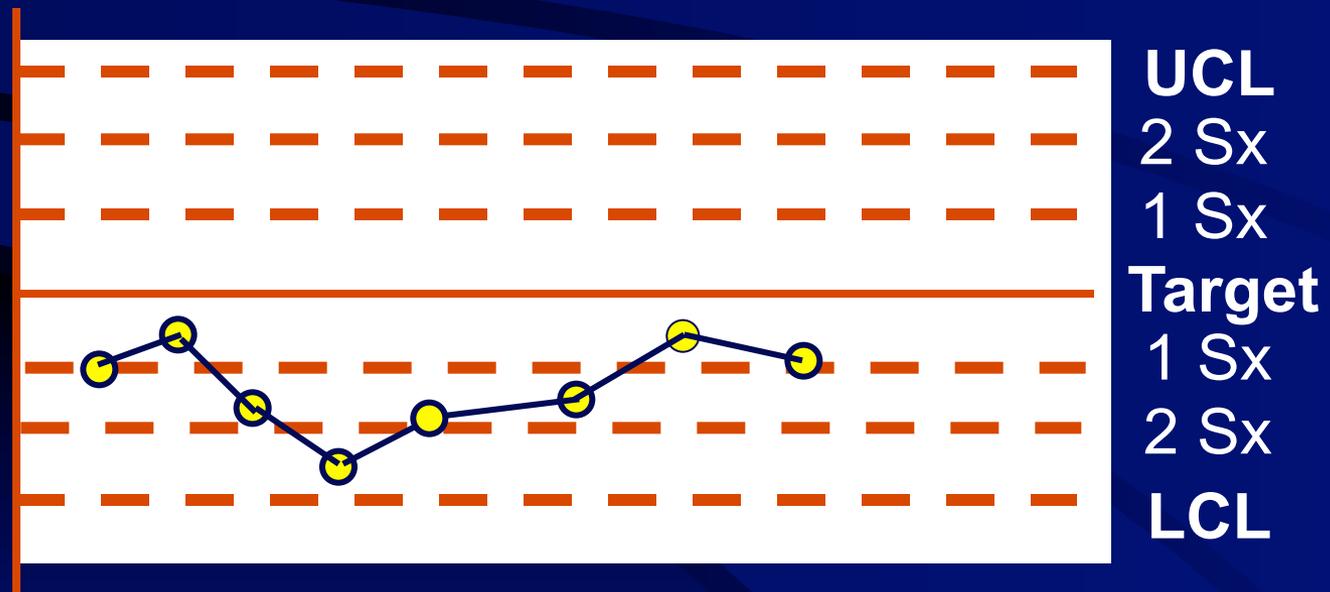
4 of 5 consecutive points beyond $\pm 1S_x$ from the target.



Western Electric Rules

Rule 4:

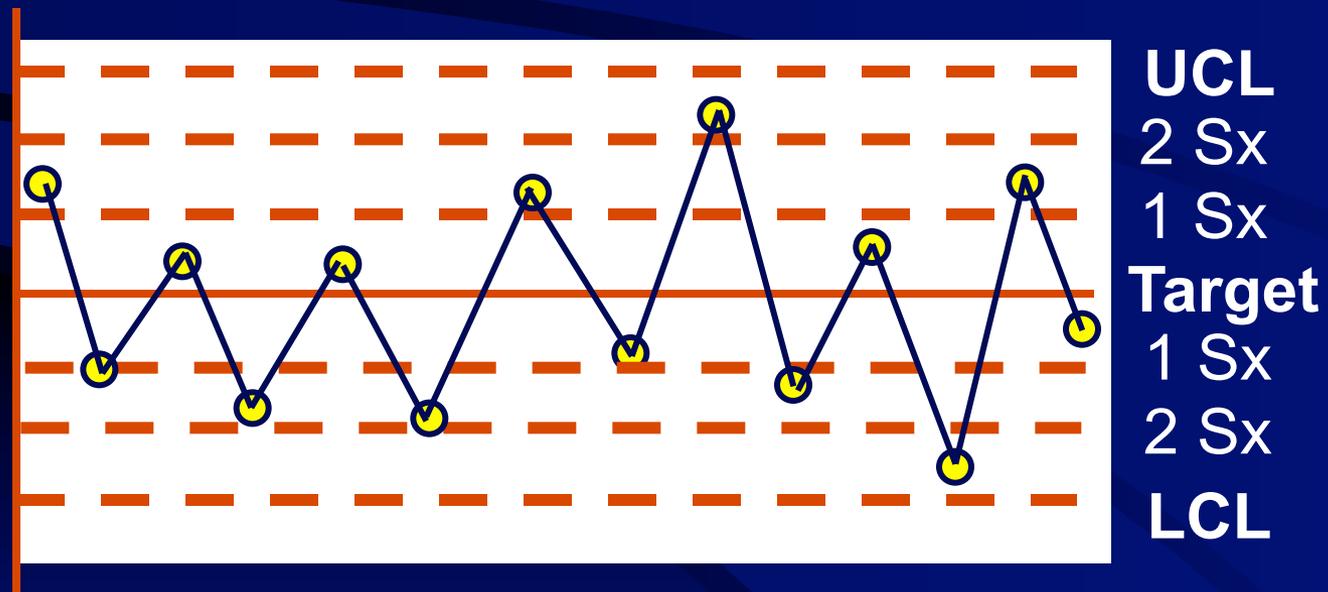
8 consecutive points on one side of target.



Western Electric Rules

Rule 5:

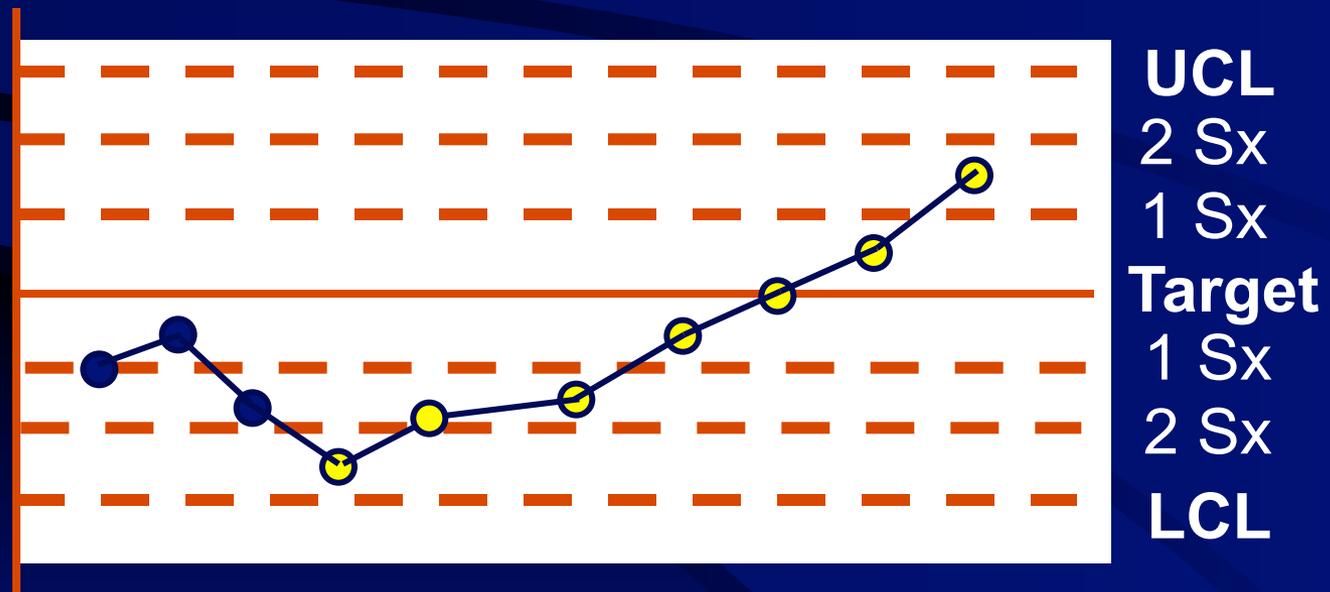
Approx. 14+ points high/low/high/low without interruption.



Western Electric Rules

Rule 6: (Trends)

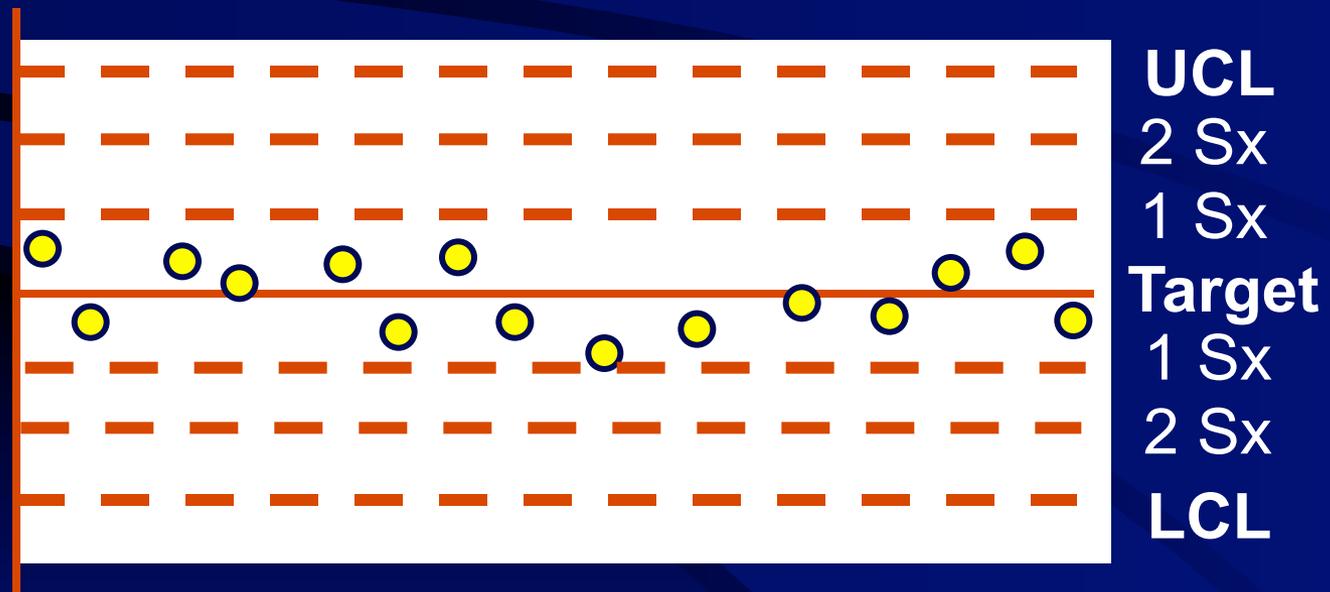
7 consecutive points increasing or decreasing.



Western Electric Rules

Rule 7:

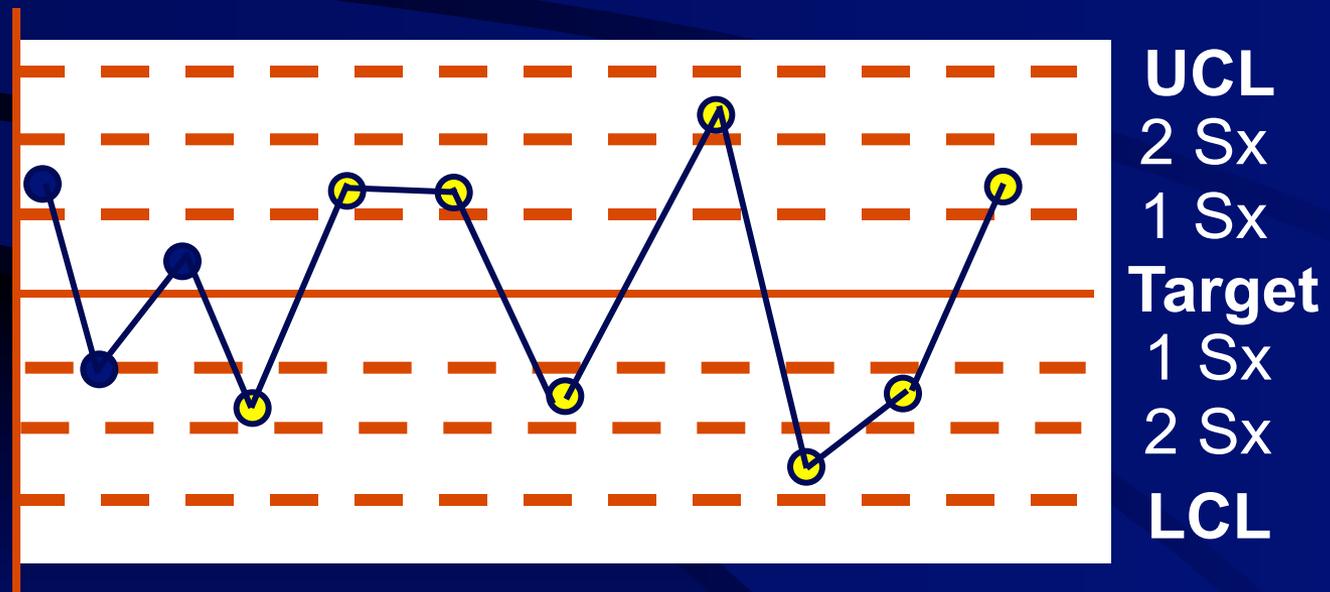
15+ points within $\pm 1 S_x$ either above or below center line.



Western Electric Rules

Rule 8:

8 consecutive points on both sides of the Target and outside $\pm 1 S_x$.

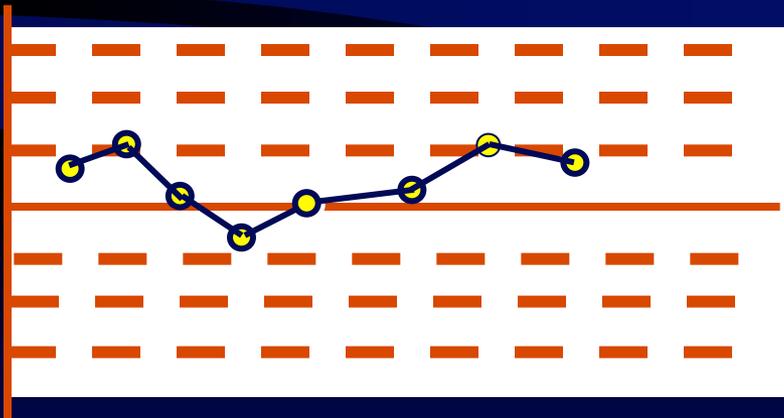


Western Electric Rules

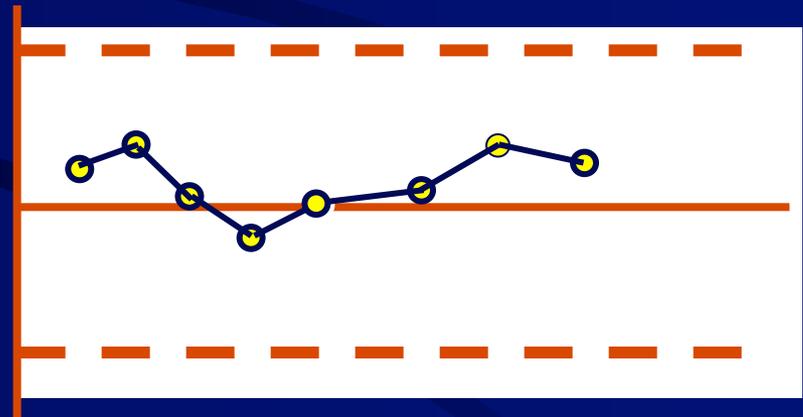
Rule 9:

A tendency of one chart to follow another.

X-bar chart

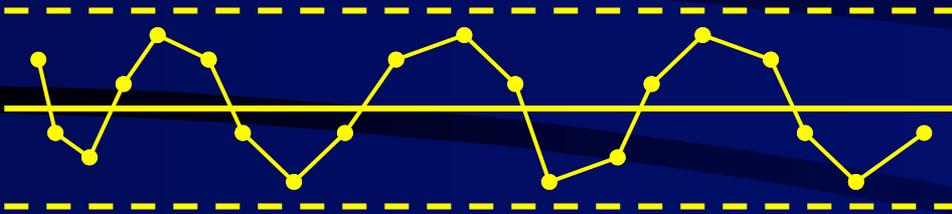


R - chart

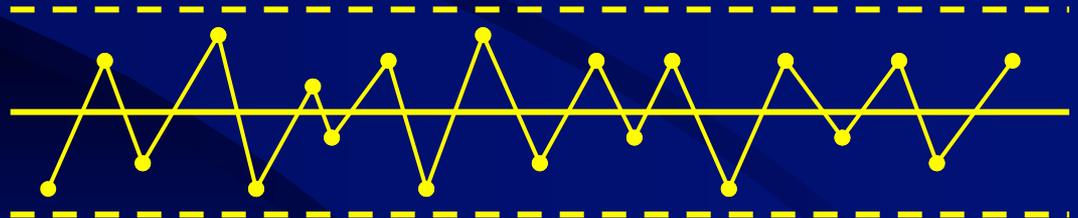


Patterns

Cyclic or oscillatory patterns

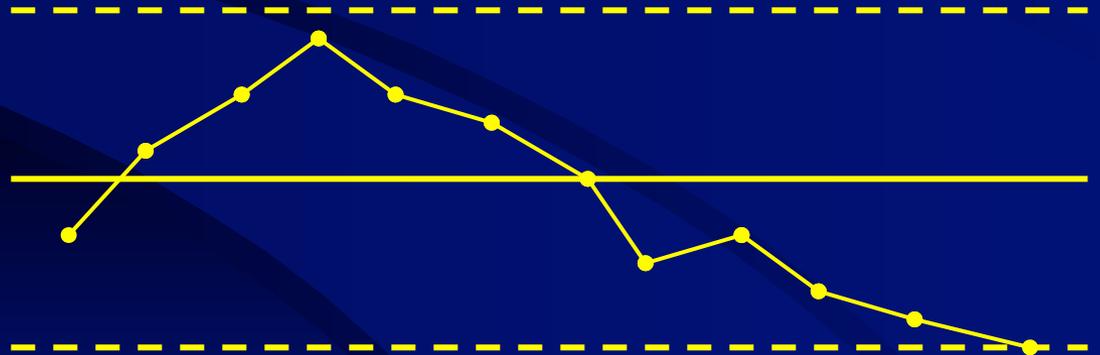
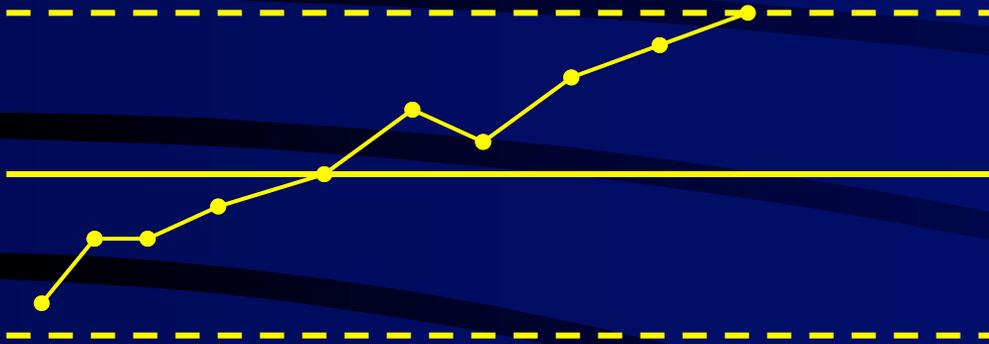


Sawtooth



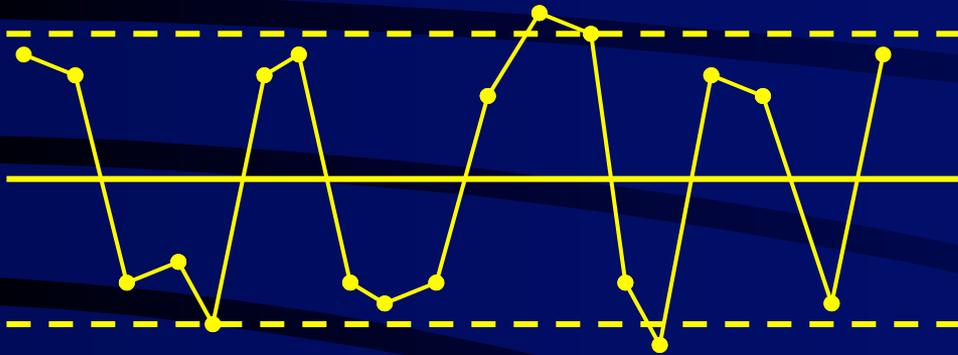
Patterns

Trends



Patterns

Mixtures



Shift in Process

