Measurement for Improvement

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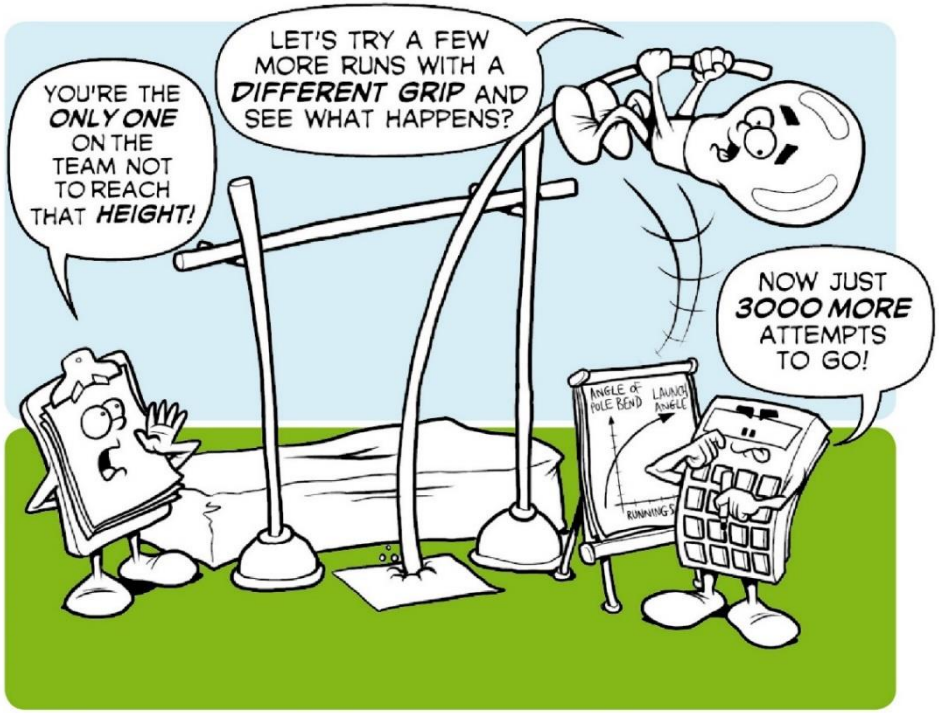
Leadership for change
Spread of innovation
Engagement to mobilise
Our shared purpose
Improvement methodology
System drivers
Rigorous delivery
Transparent measurement

The traditions of measurement



Research

- eg A-B comparison, average, huge dataset

Judgement

- eg one-to-many benchmarking comparision, average, large dataset

Improvement

- eg continual analysis of single changing process over time

Measurement mindsets

	Research	Judgement	Improvement
Goal	New knowledge (not its applicability)	Comparison Reward / punishment Spur for change	Process understanding Evaluating a change
Hypothesis	Fixed	None	Multiple and flexible
Measures	Many	Very few	Few
Time period	Long, past	Long/medium, past	Short, current
Sample	Large	Large	Small
Confounders	Measure or control	Describe and try to measure	Consider but rarely measured
Risks in improvement settings	Ignores time based variation Over-engineers data collection	Ignores time based variation Over-reaction to natural variation	Incorrectly perceived as 'inferior statistics'

Based on L Solberg, G Mosser and S McDonald (1997) The Three Faces of Performance Measurement: Improvement, Accountability and Research, Journal on Quality Improvement, 23 (3): 135 - 147.

Model for Improvement

What are we trying to accomplish?

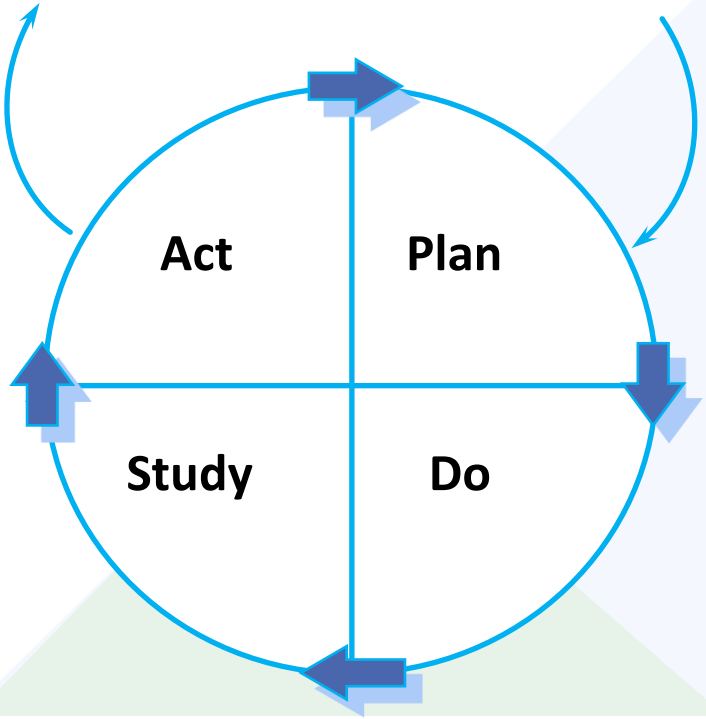
How will we know that a change is an improvement?

What changes can we make that will result in the improvements that we seek ?

Aims

measurements

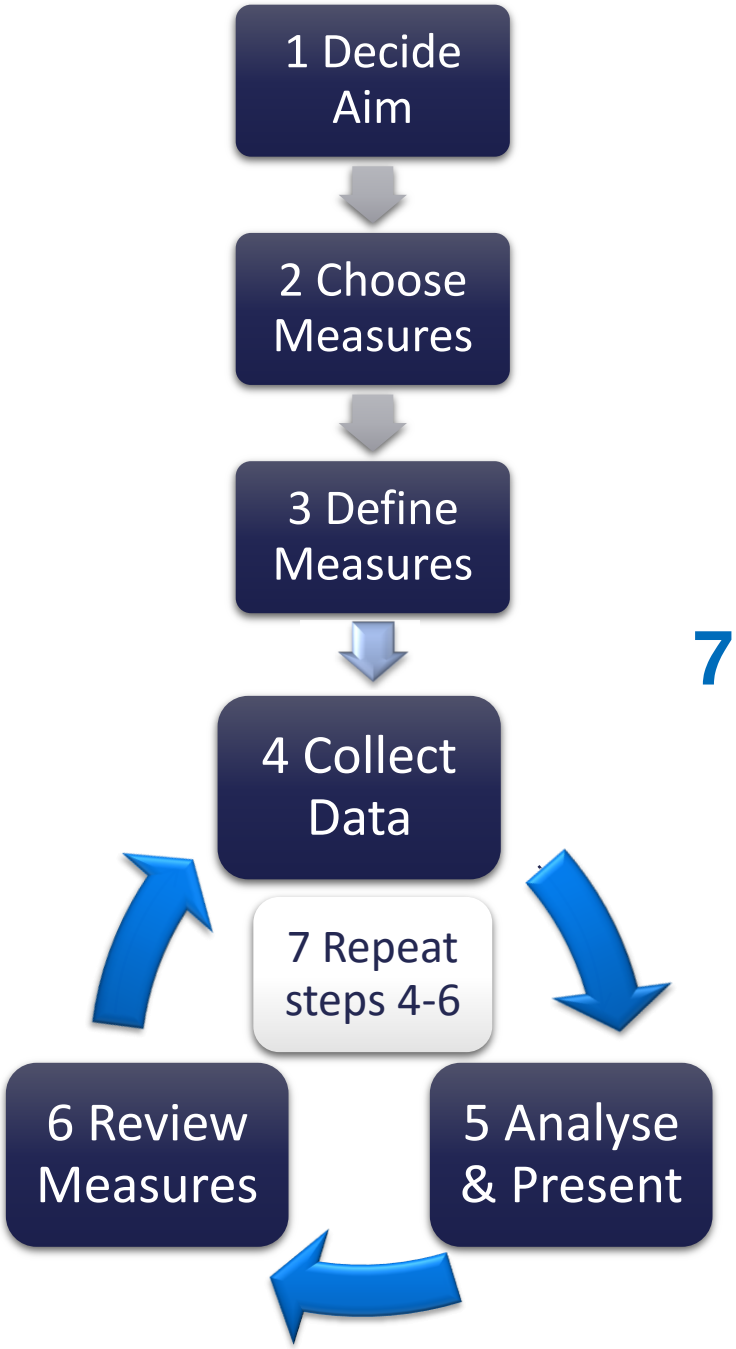
change ideas



testing ideas before implementing changes

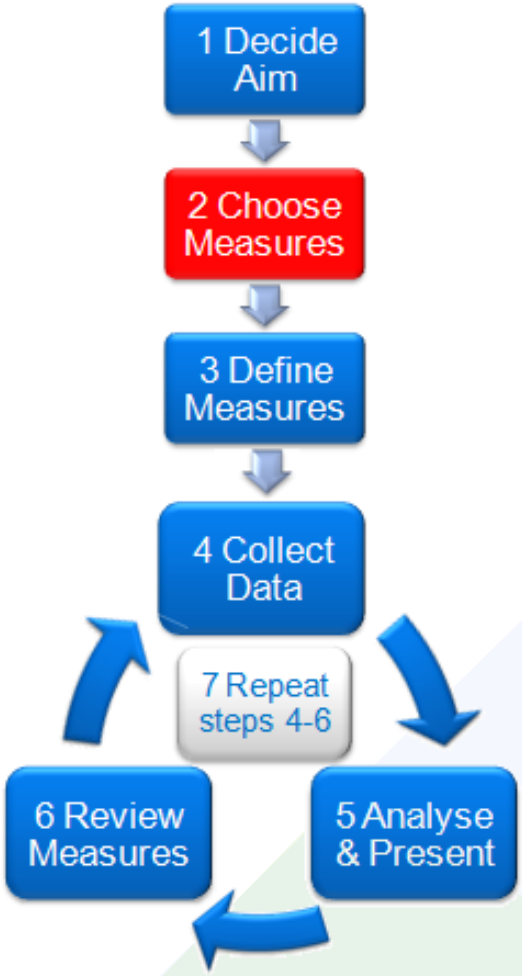
The Improvement Guide
Langley et al (1996)

Model for improvement



7 Steps to measurement

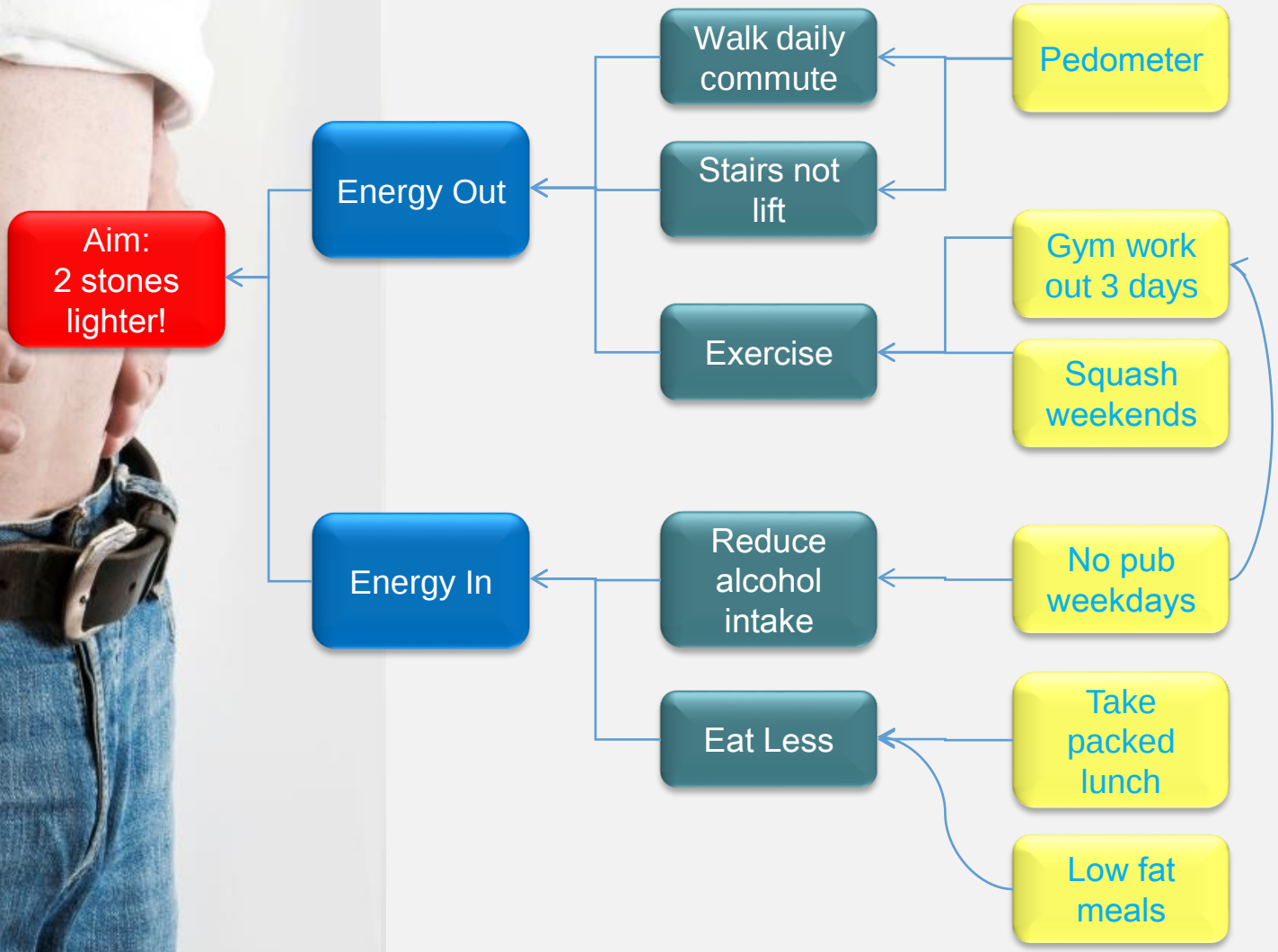
Step 2 – Choose Measures



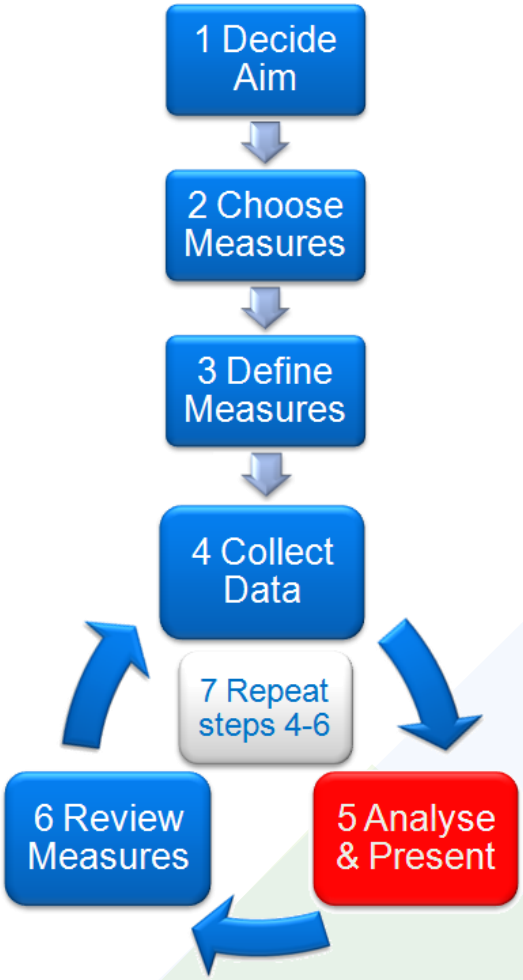
There are two tools to help you choose measures

1. Process Mapping
2. Driver Diagrams

Driver Diagrams – weight loss example



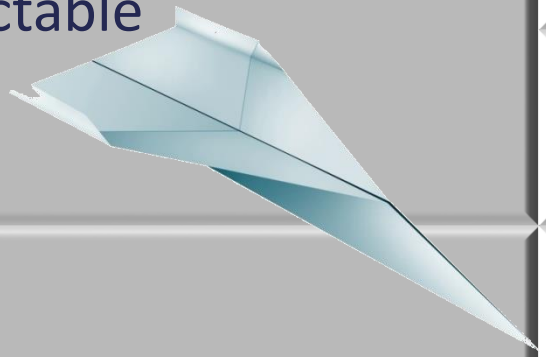
Step 5 – Analyse & Present



We will now focus in more detail on methods of presenting and analysing our chosen measures….

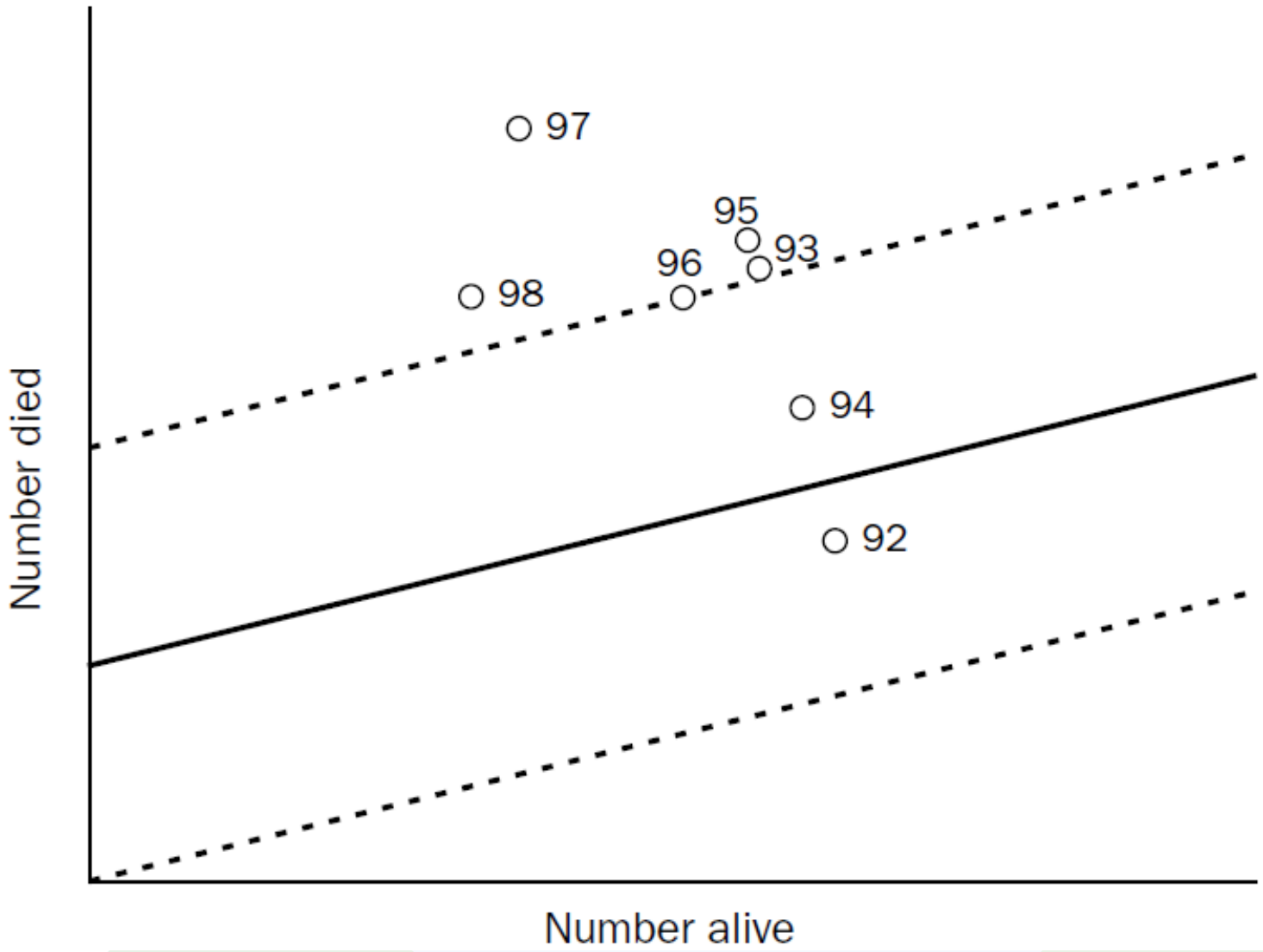
Can we classify variation?

Common Cause	Stable in time and therefore relatively predictable	Paper selection
		Persons technique
		Design of the plane
Special Cause	Irregular in time and therefore unpredictable	Water spill
		Fire




The Quality
Improvement
Healthcare
Company
delivering your quality and value

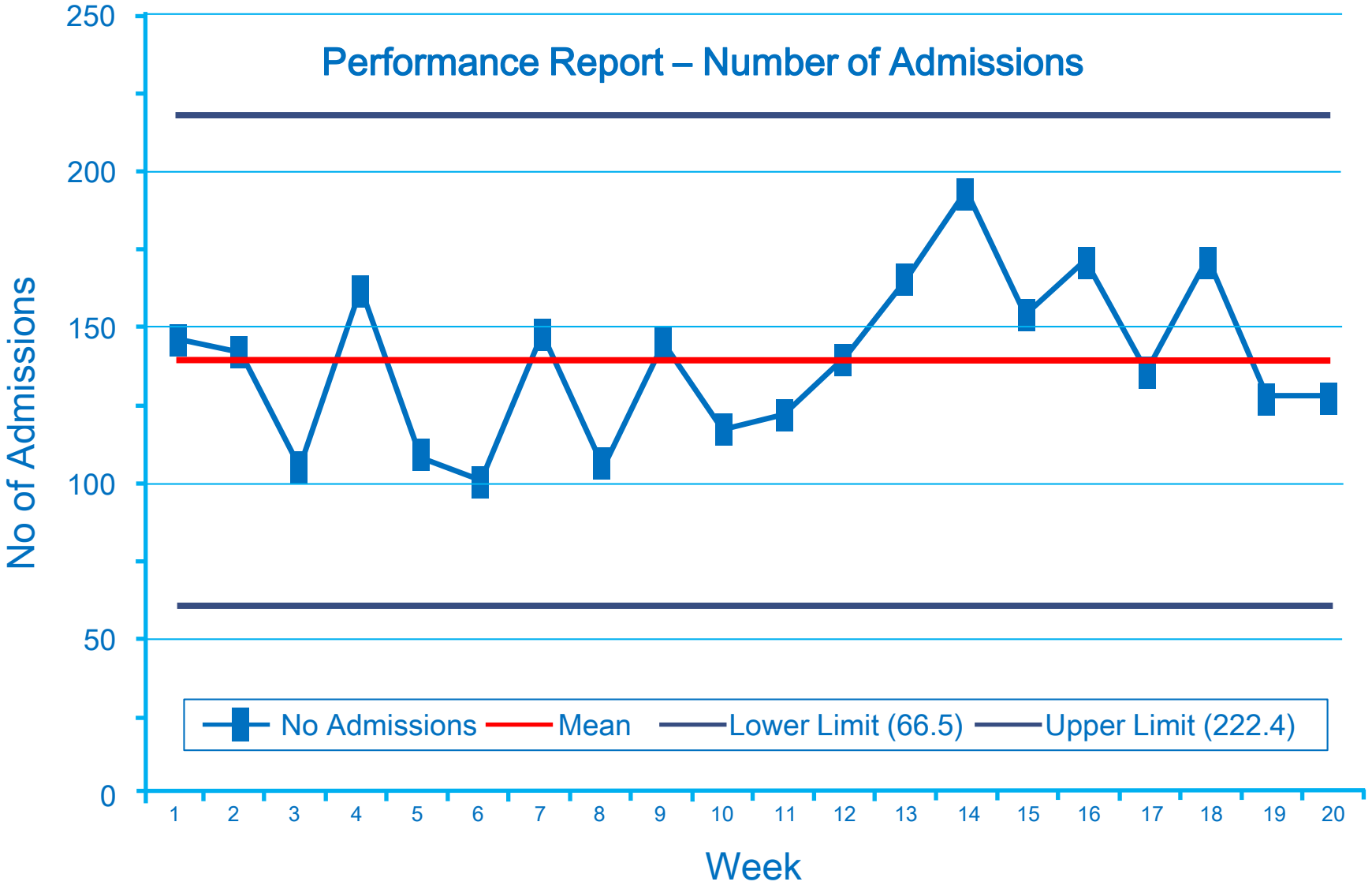
What is SPC?


97
95
93
96
98
94
92
Number died
Number alive

Statistical Process Control (SPC) charts…

- …use the pattern of events in the past to predict with some degree of certainty where future events should fall
- …distinguish between the natural/common cause
- variation and special cause variation
- …enable you to look for problems when they are there, not when they are not
- …can motivate staff to improve practice thereby reducing adverse events and minimising variation

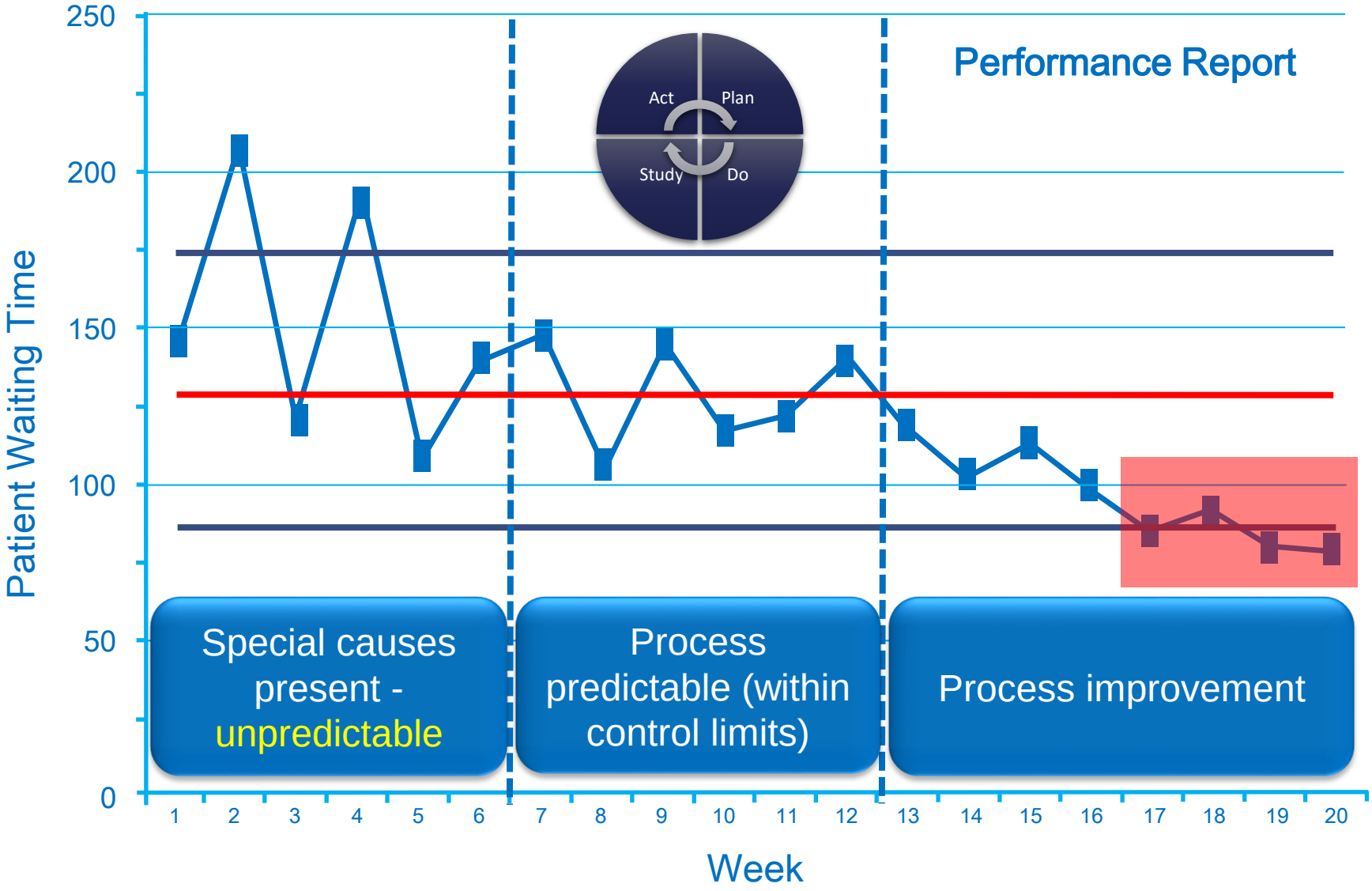
Statistical Process Control (SPC) Charts:



2 Ways to improve a process

If uncontrolled (special) variation	Process is unstable and unpredictable
	Variation caused by factors outside process
	External cause should be identified and sorted
If controlled (common) variation	Process is stable and predictable
	Variation is inherent to the process
	Therefore the process must be changed

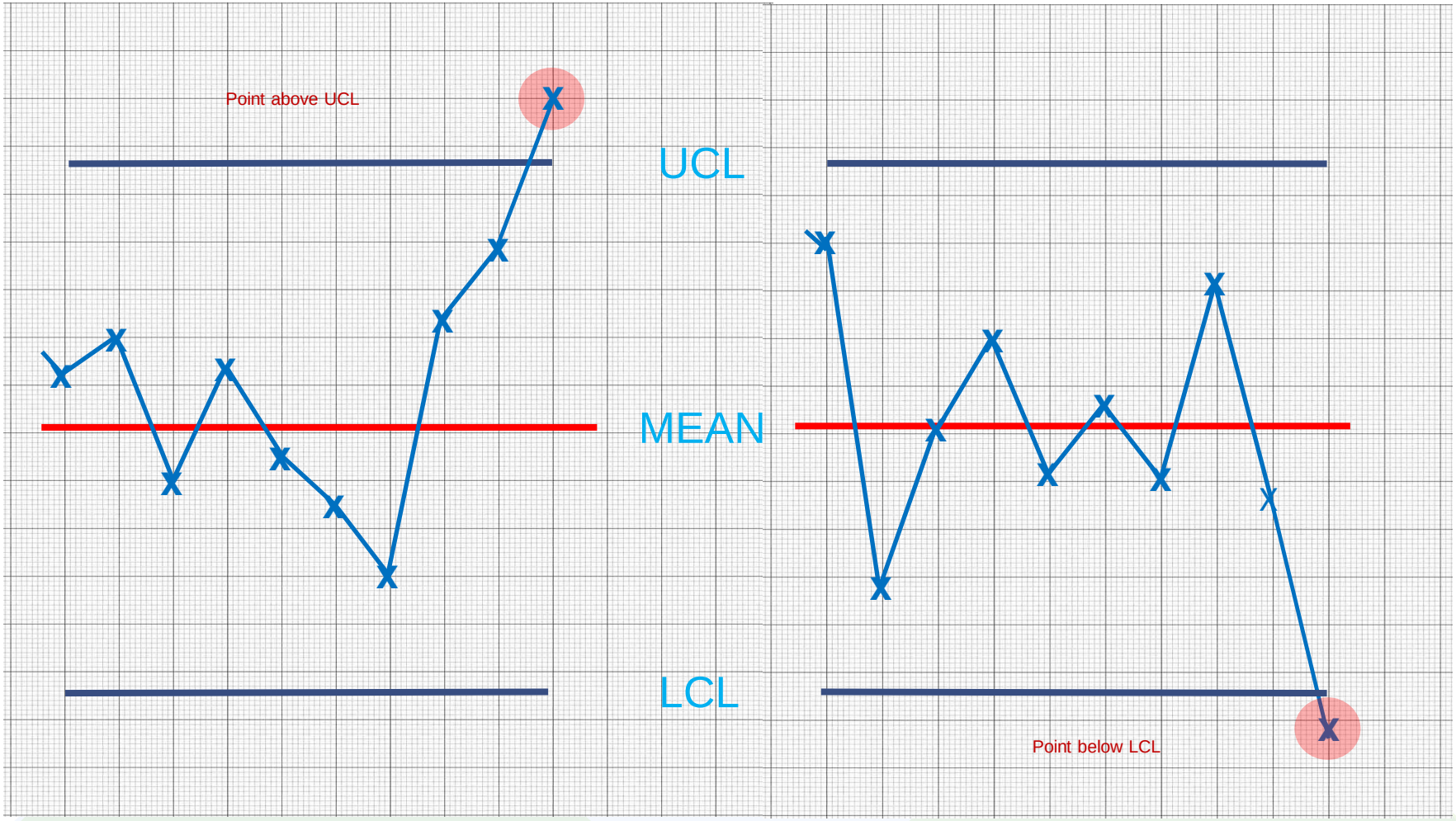
The improvement process



Interpreting Charts

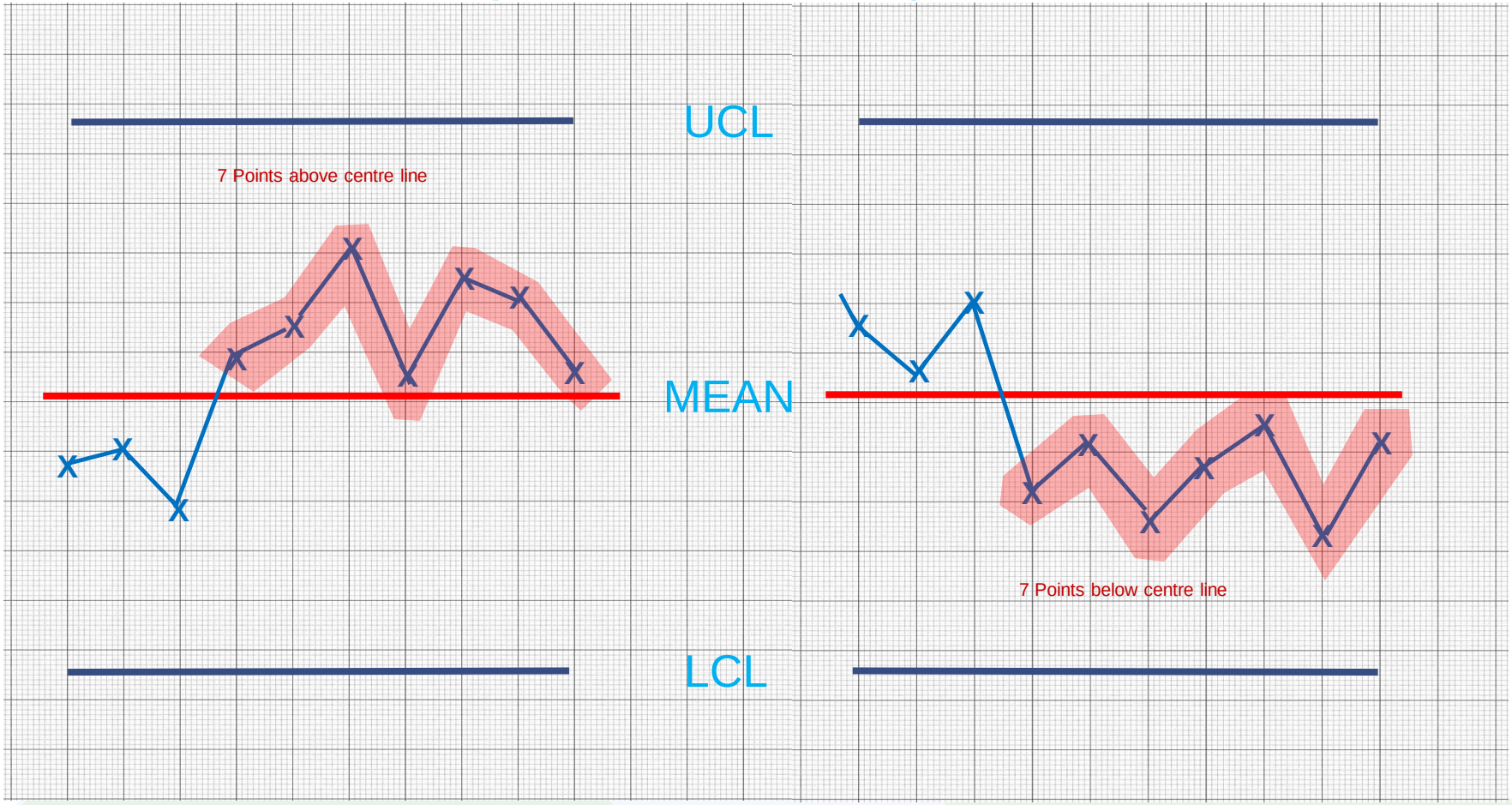
Special causes

Rule 1 - Any point outside one of the control limits



Special causes

Rule 2 - A run of seven points all above or all below the centre line, or all increasing or all decreasing



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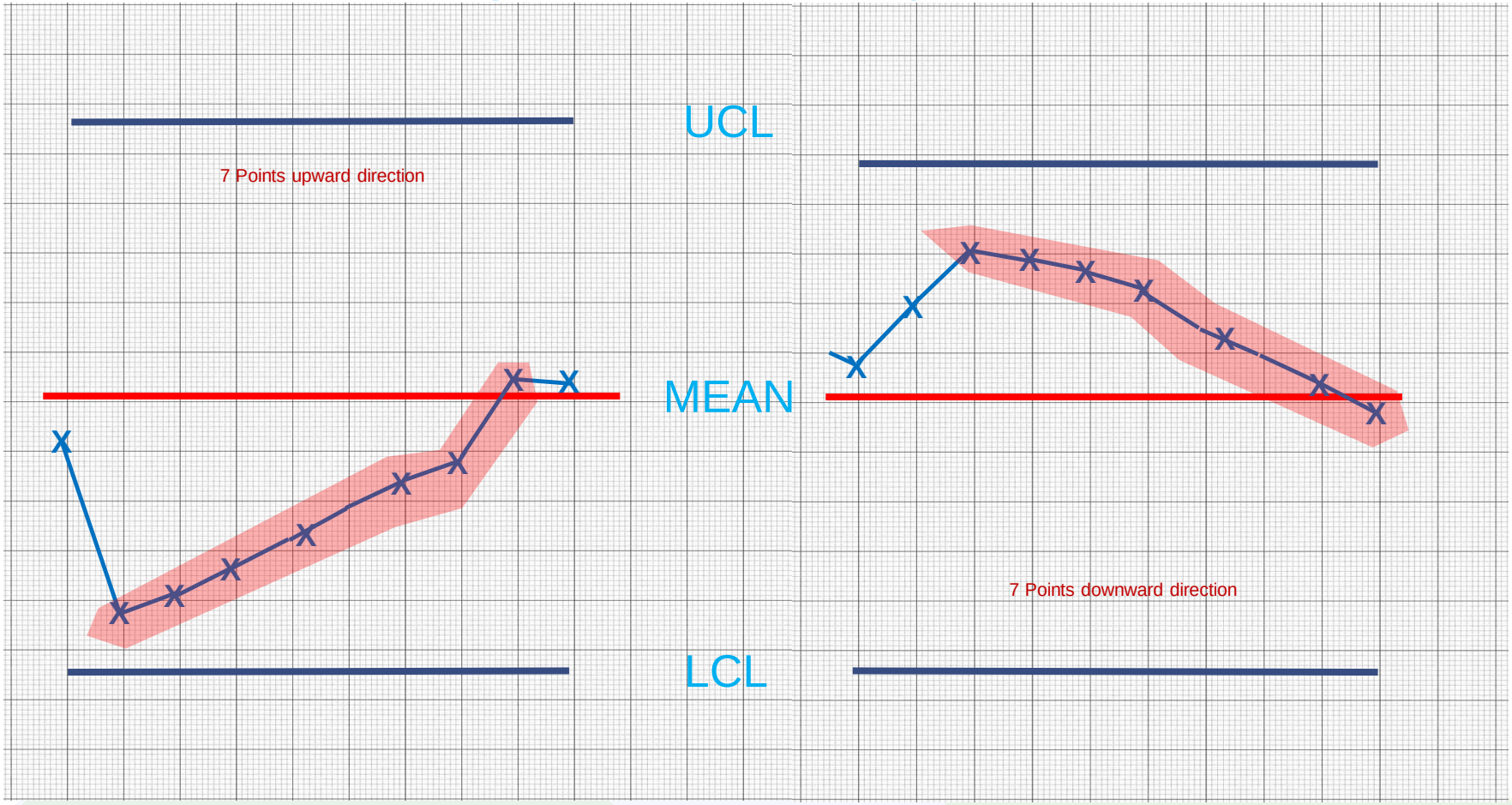
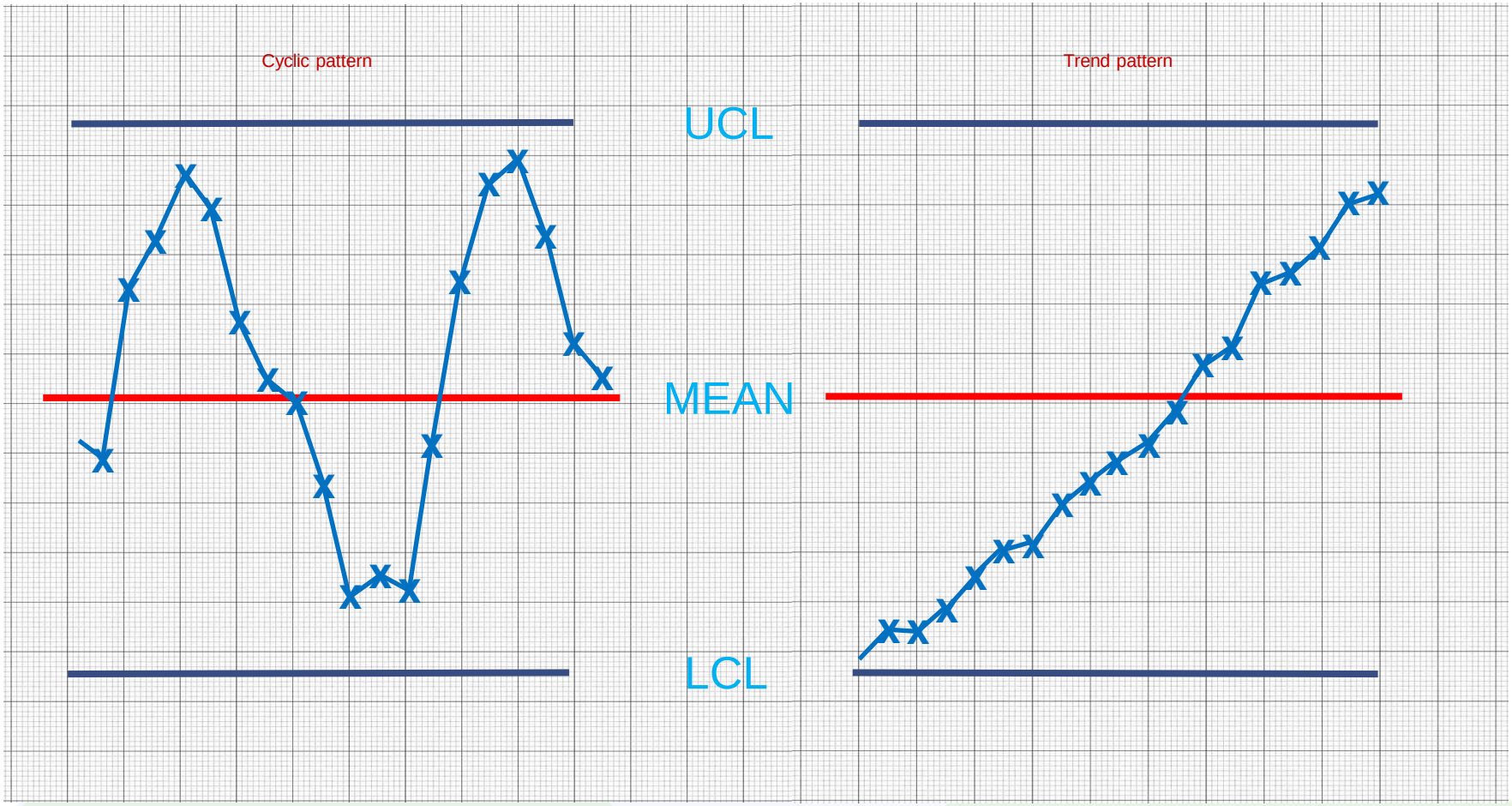


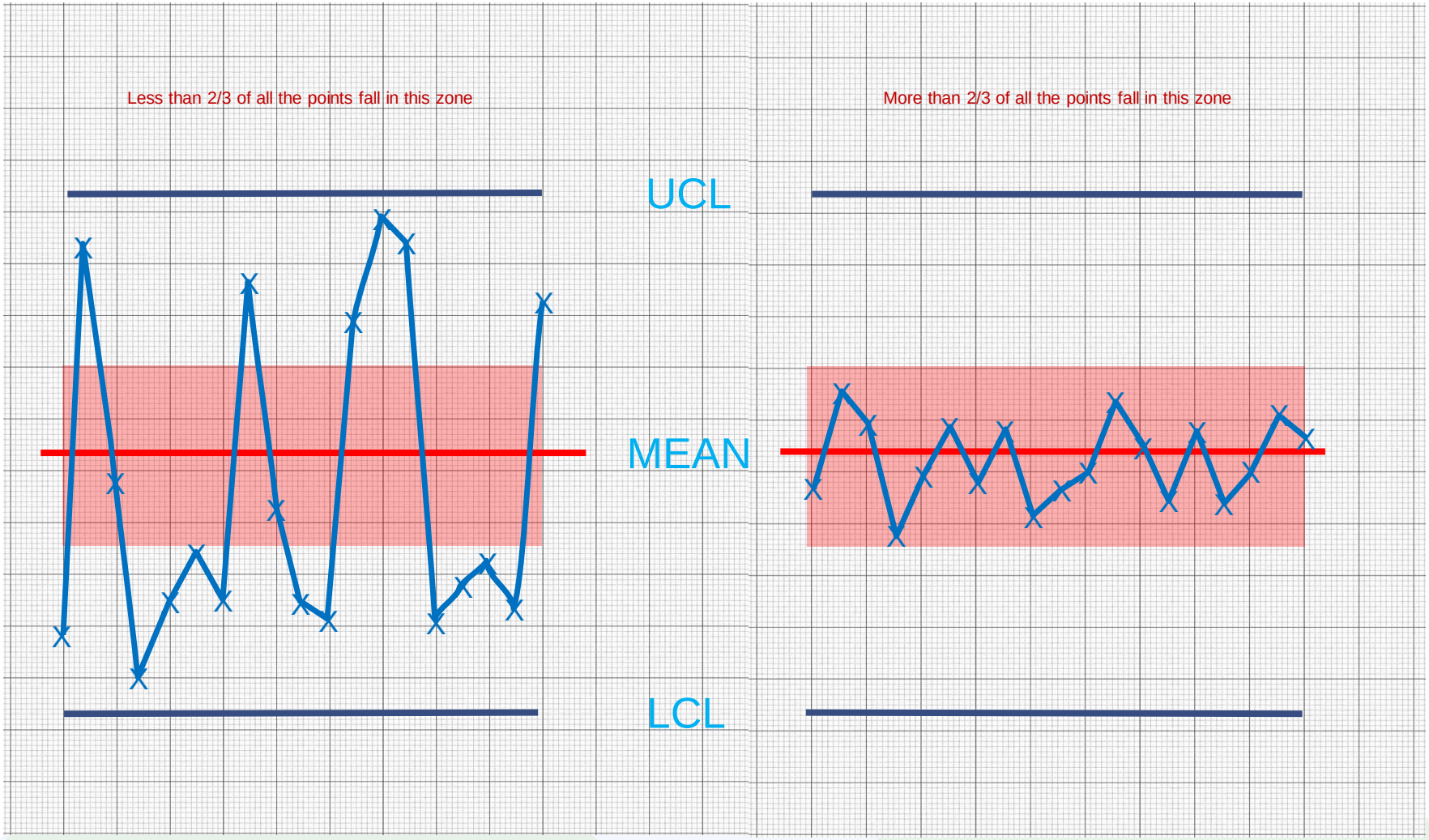
Special causes

Rule 3 - Any “unusual” pattern or trends within the control limits



Special causes

Rule 4



Process out of control

- These rules are important!
- They tell us if the process is stable or unstable
- They tell us if common or special cause
- variation is present

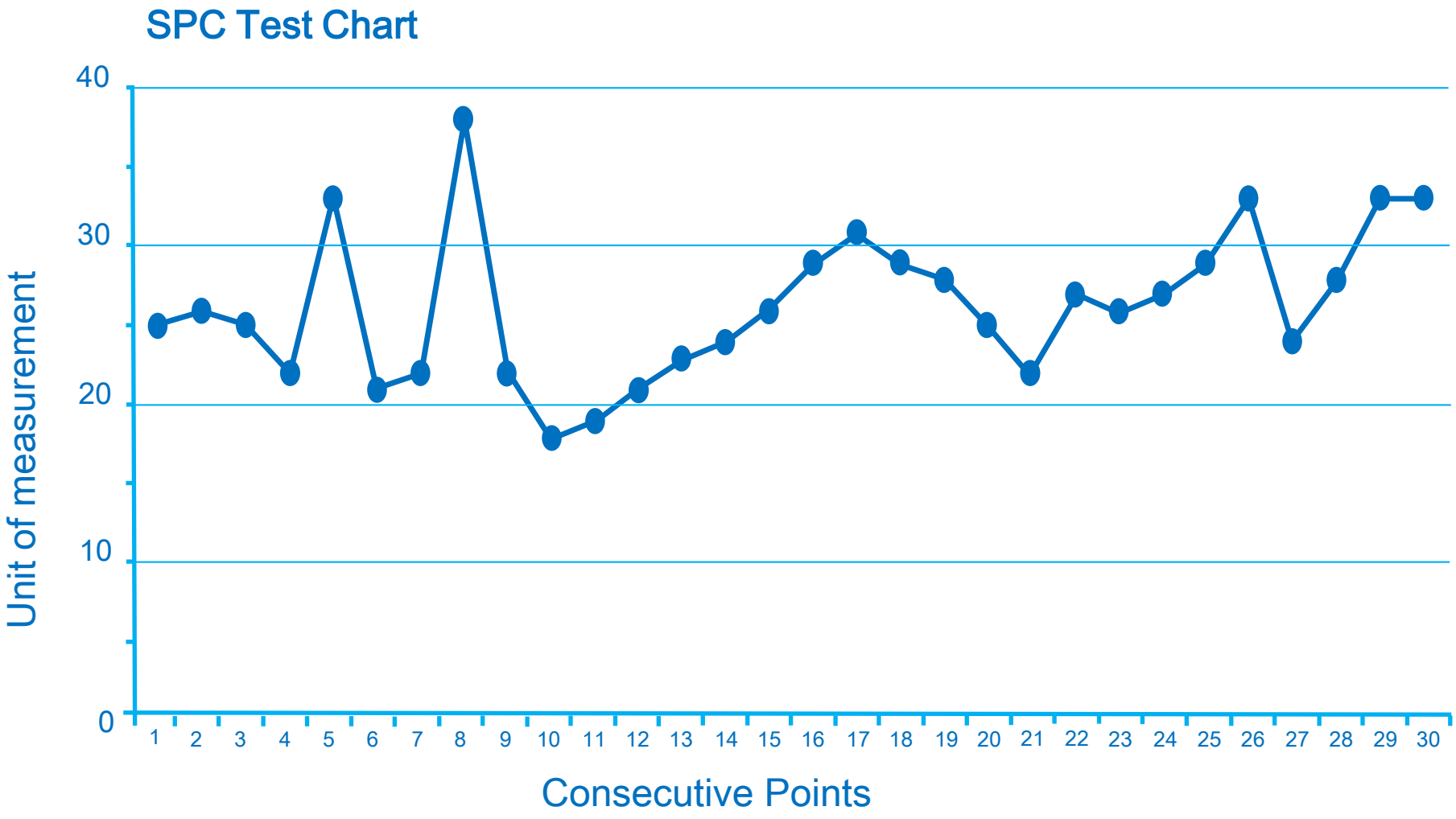
Remember the rules!

- Outside control limits
- Run of 7 or more consecutive points
- Patterns
- Rule of thirds

Constructing the chart

- There are 5 steps to constructing your chart:
  1. Plot the individual values
  2. Derive the moving range values
  3. Calculate the mean (X) and plot it
  4. Calculate the average moving range (R)
  5. Derive upper and lower limits from this and plot them

1. Plot individual values



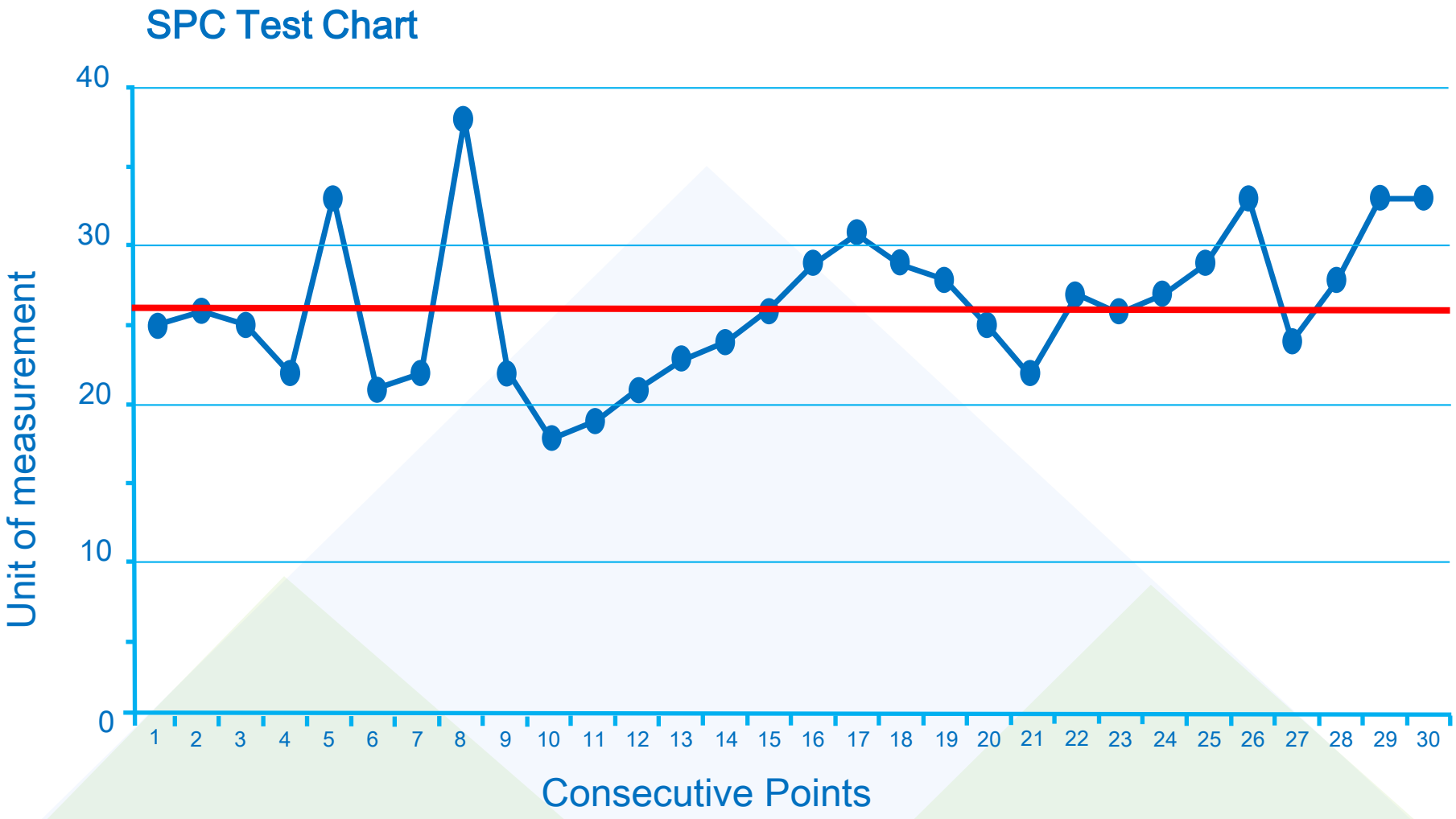
2: Derive moving range

These are required to calculate the control limits
The first row contains the chart data
Use the second row to record the difference between successive data values

The difference is always recorded as a positive value

X Data	0	0	5	4	8	9
Moving Range		0	5	1	4	1

3. Calculate Mean & plot it



4: Calculate Average Moving Range

R_1	R_2	R_3	R_4	R_5	R_6	R_7	R_8	...	R_{23}	R_{24}
60	165	75	30	150	320	155	15		155	60

Average Moving Range $= \overline{mR}$

$$= \frac{60+165+75+30+150+320+155+15 \ldots\ldots\ldots\ldots\ldots\ldots+60}{n}$$

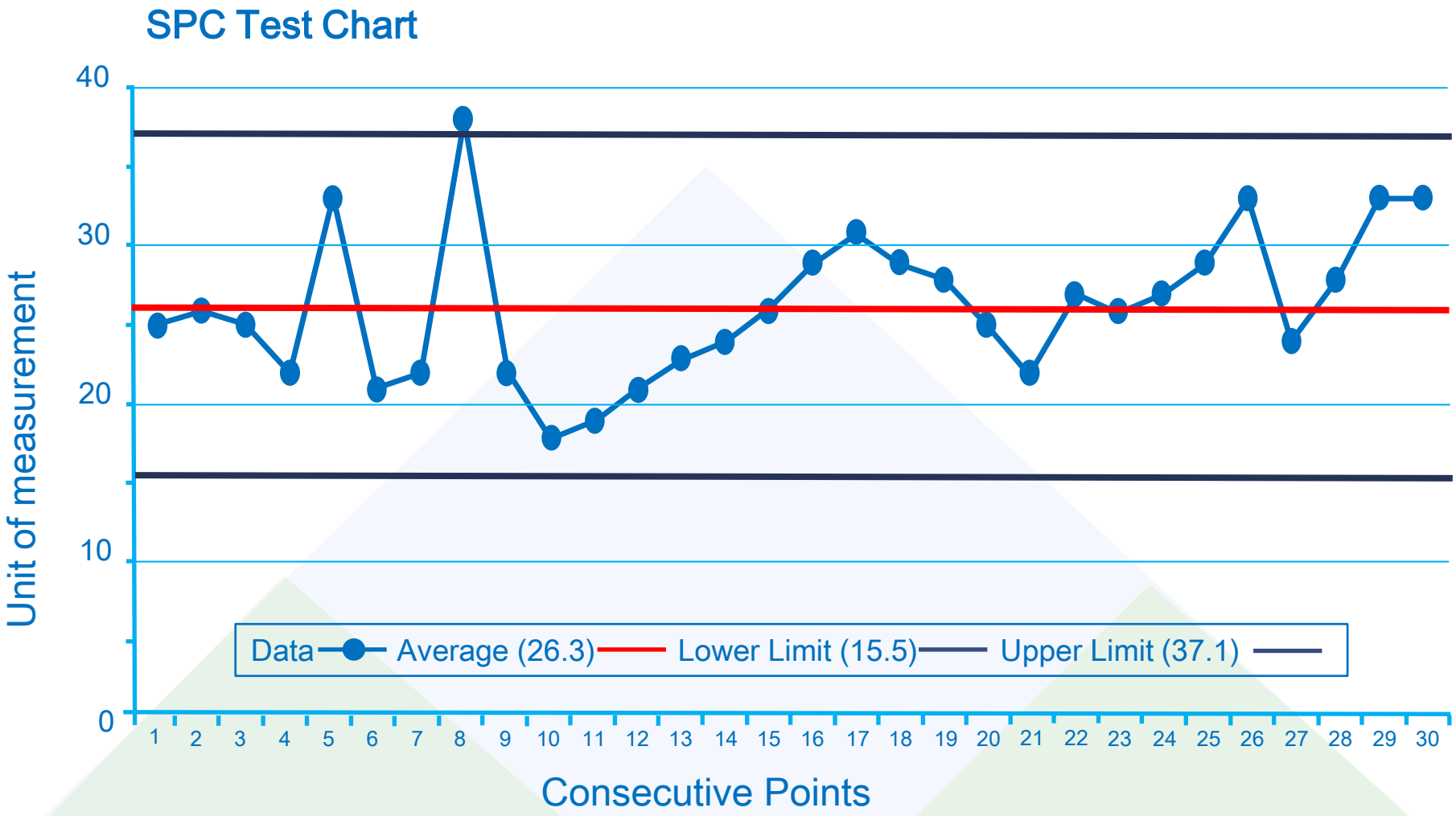
$$= \frac{24}{}$$

Sum of the R's / Number of readings $= \frac{1960}{24}$

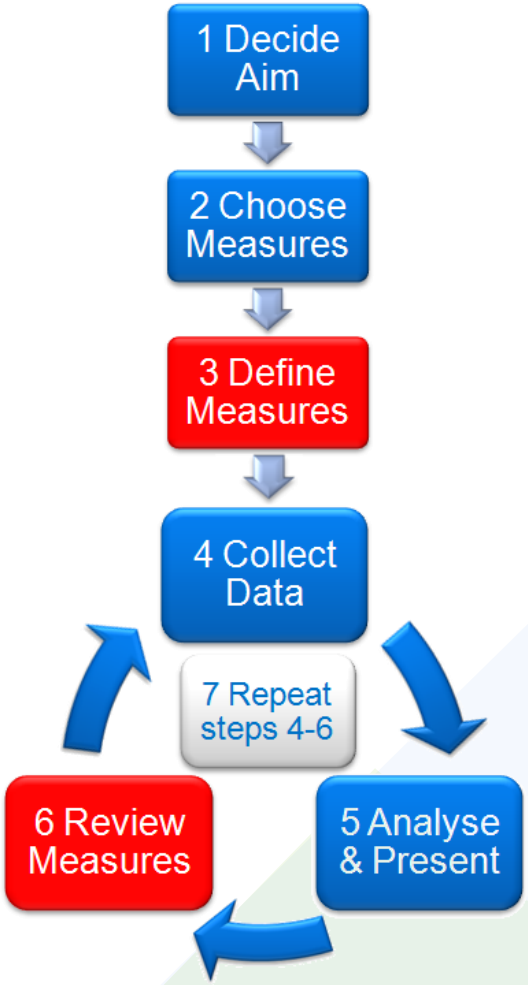
5: Derive process limits

Derive measure of variation (1 sigma) as:	Average moving range / 1.128	19.3 / 1.128
Calculate upper limit as:	Mean + 3 sigma	=58 + (3*(19.3/1.128))
Calculate lower limit as:	Mean – 3 sigma	=58 - (3*(19.3/1.128))

5. Plot process limits



Step 6 – Review Measures



"It is a waste of time collecting and analysing your data if you don't take action on the results"

Measurement recap

1. Remember variation exists
2. Define what you are collecting clearly
3. Only interpret data using statistically significant measures
4. Use SPC for all stages of your project