

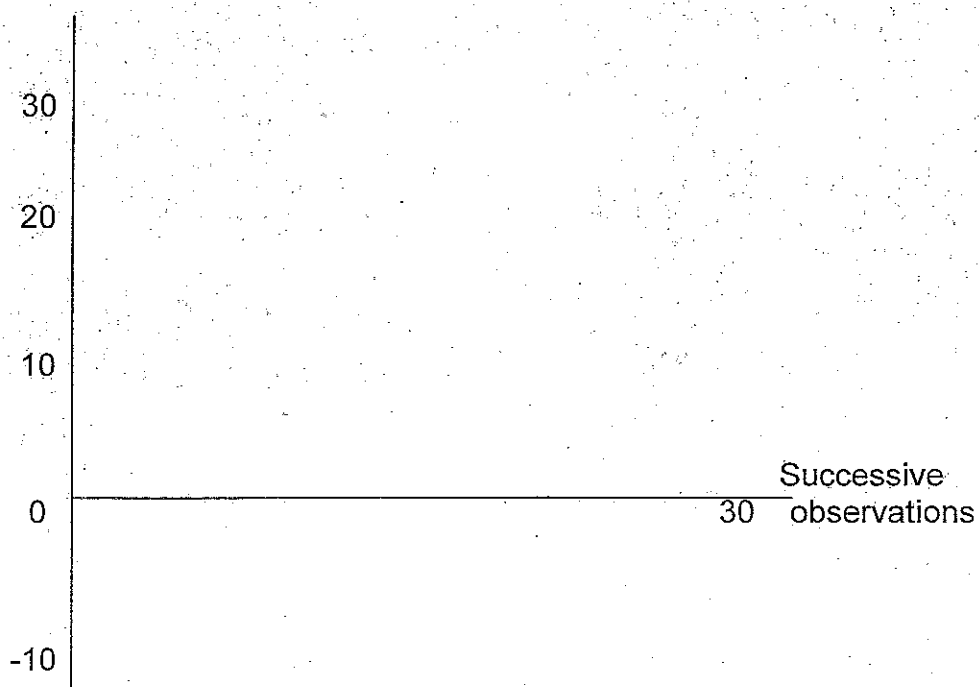
Cusum Charting

The Cumulative sum chart (cusum chart) has been designed to identify slight but sustained shifts in a process. It incorporates all past data by plotting cumulative sums of the deviations of sample values from a target or reference value. This target value T , which corresponds to the target (best) level of our quality characteristic, is subtracted from each observation. The cumulative sum of these deviations from target is the plot point.

Consider the following data, obtained from a process at intervals in order shown, where a target value of 10 has been set:

Observation	Value	Deviation from target ($T = 10$)	Cumulative sum of deviation
1	10	0	0
2	11	1	1
3	9	-1	0
4	10	0	0
5	12	2	2
6	9	-1	1
7	10	0	1
8	8	-2	-1
9	10	0	-1
10	11	1	0

Set up the graph sheet on the next page in the format of the figure below and plot the first ten points



value. Conversely if the straight line is downwards, the new average is below the target value.

3. If the line is curved upwards, the new average is above the target, and still increasing. Similarly if it is curved downwards, the average is below the target and still reducing.
4. It should be noted that the position of a point on the chart represents the cumulative past history of the process, since observations were started. Thus there is no particular significance in whether the point is high up or low down on the paper. If points run over the top of the chart, it is common practice to restart them again near the bottom. All that matters is the direction in which the points are heading. In our example we must adjust the process so that they keep a horizontal course if we wish to control the process at the target value of 10.

Calculation of averages

The cusum chart clearly shows up changes in average value. To assess the magnitude of these changes a slope guide or protractor can be put on the chart. A horizontal line ten samples long represents an average level on target (T). Other lines can then be constructed at angles corresponding to a suitable range of average levels. An example is shown below

