

CIMT Further Statistics p150 Activity 2

a) X = weight of one Mars Bar

$E(X) = 61.5$ and $\text{Var}(X) = 2.6^2$

Samples of size $n = 10$ and we assume that X is distributed normally

$X \sim N(61.5, 2.6^2)$

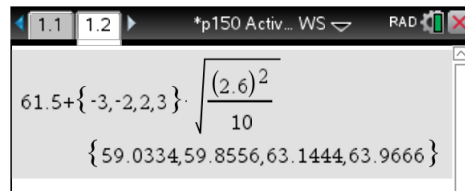
$\bar{X} \sim N\left(61.5, \frac{2.6^2}{10}\right)$ where \bar{X} = mean of weights of Mars Bars of sample of size 10

$$UCL = 61.5 + 3\sqrt{\frac{2.6^2}{10}} = 63.97$$

$$UWL = 61.5 + 2\sqrt{\frac{2.6^2}{10}} = 63.14$$

$$LWL = 61.5 - 2\sqrt{\frac{2.6^2}{10}} = 59.86$$

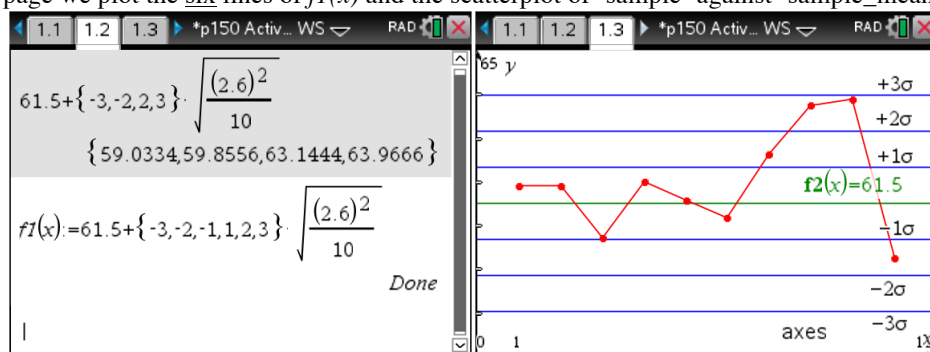
$$LCL = 61.5 - 3\sqrt{\frac{2.6^2}{10}} = 59.03$$



To generate the data for the control charts, we add in an extra column for the sample means:

A	sample	B	value1	C	value2	D	value3	E	value4	F	value5	G	sample...	H
=													=(value1+	
1	1	59.55	62.33	63.68	67.1	56.85	61.902							
2	2	64.57	60.14	62.51	62.02	60.16	61.88							
3	3	63.34	60.01	59.11	62.57	58.48	60.702							
4	4	58.55	65.36	63.03	60.72	62.26	61.984							
5	5	59.8	61.45	60.78	61.89	63.91	61.566							
6	6	61.82	58.98	62.63	59.68	62.7	61.162							
7	7	59.9	57.73	66.03	64.25	65.2	62.622							
8	8	62.17	61.29	69.01	63.31	62.92	63.74							
9	9	68.11	65.46	57.81	64.73	63.27	63.876							
10	10	60.46	59.05	65.06	55.08	61.6	60.25							
11														
12														
sample_mean:=value1+value2+value3+value4+value5														
5														

And on a graph page we plot the six lines of $fI(x)$ and the scatterplot of 'sample' against 'sample_mean'



c) We bear in mind the following Western Electric Company Rules for Control Charts:

- Any single data point falls outside a 3σ limit
- Two out of three consecutive points fall beyond the same 2σ limit
- Four out of five consecutive points fall beyond the same 1σ limit
- Eight consecutive points fall on the same side of the centre line

No data lie outside the 3σ limits

For data points 8, 9 and 10, two of them lie outside the $+2\sigma$ limit

Hence the process is out of control and so a signal for production to stop should be given.