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BCSL-044

Statistical Techniques Lab

Prepared by



 **730-339-3555**

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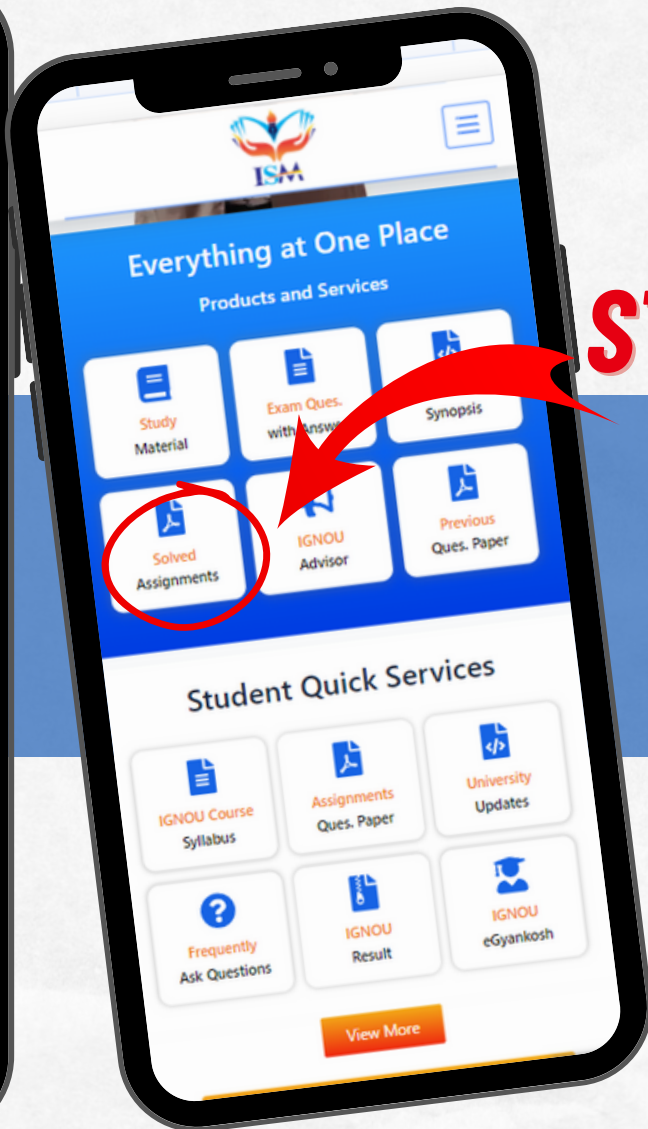
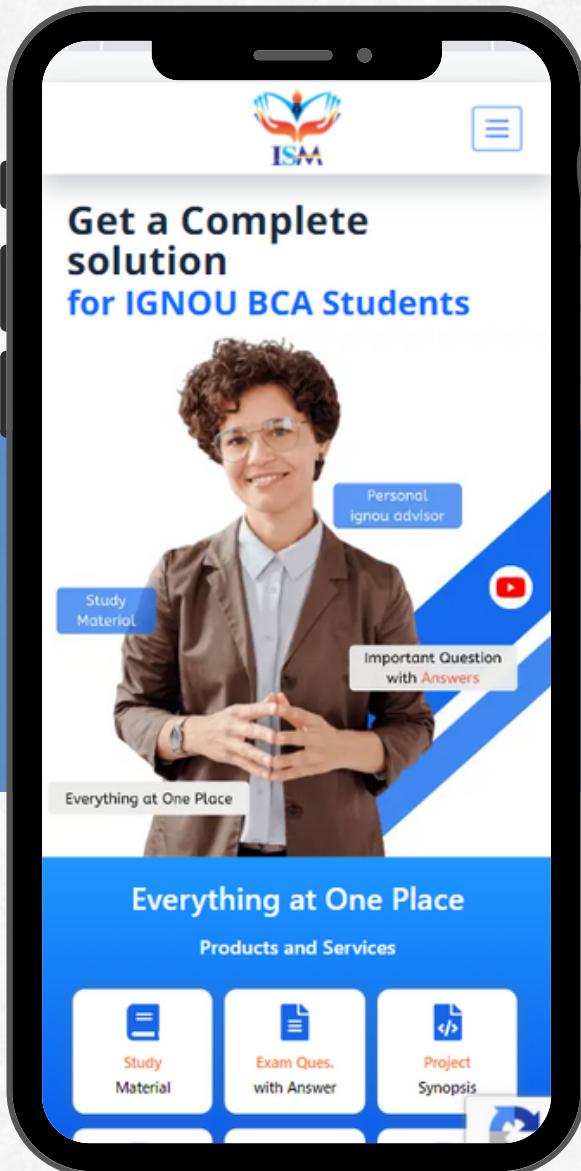


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Ques.4 The Daily Production of items of a company is given in the following table. Use spreadsheet software to find the moving averages for the length of 5.

Day	Production (in Metric tons)
1	29
2	5
3	44
4	30
5	40
6	45
7	7
8	60
9	30
10	49
11	44
12	30
13	50
14	30
15	34

Sol. To find the moving averages for the length of 5 using a spreadsheet software:

Enter the data in a spreadsheet.

Create a new column for the moving averages.

In the first cell of the new column, enter the formula for the moving average.

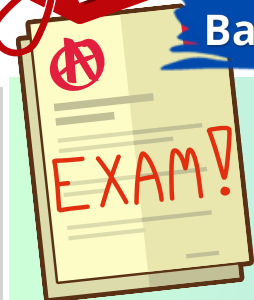
The formula is: =AVERAGE(A2:A6)

where A2 to A6 are the cells that contain the first 5 data points.

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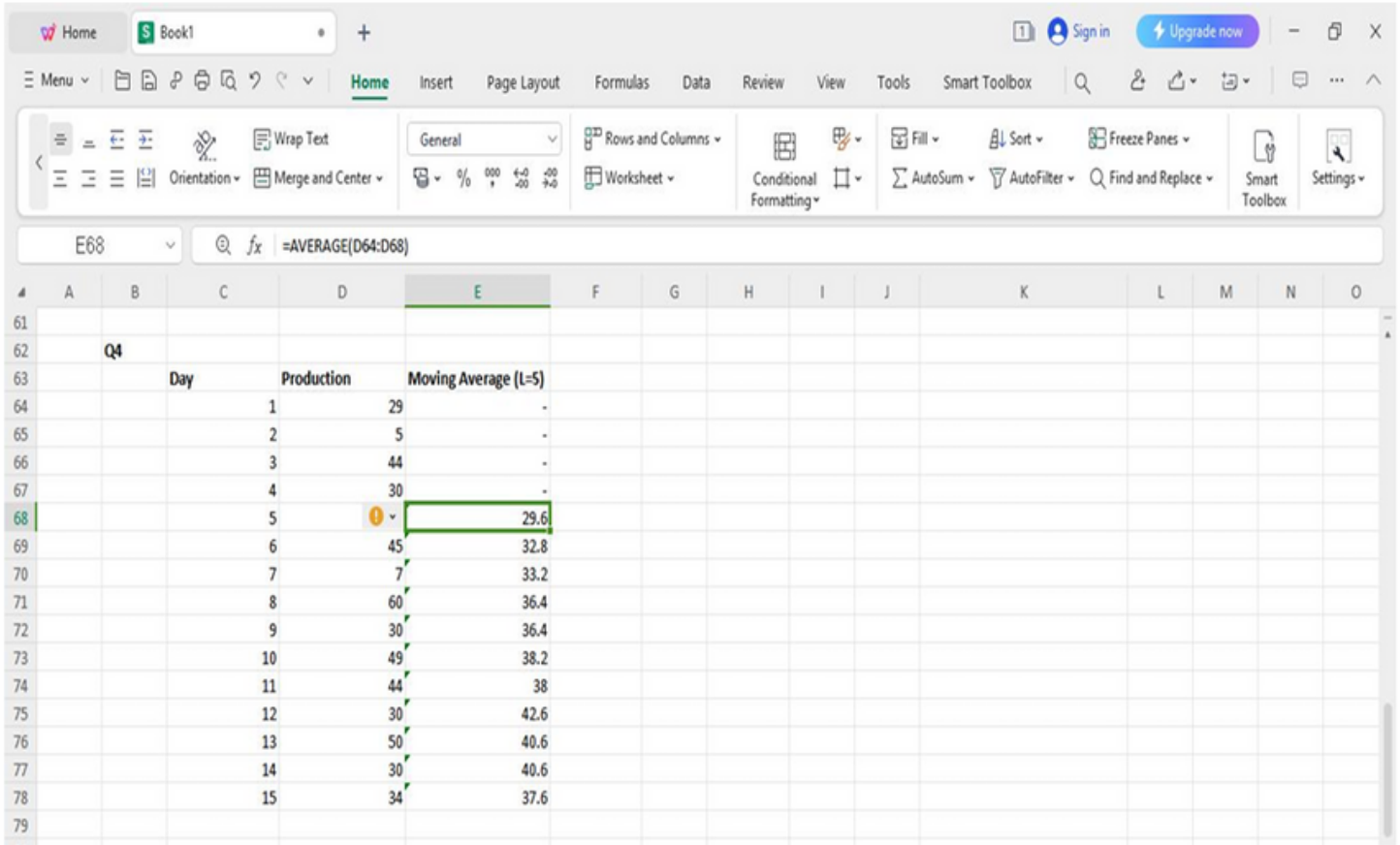
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Copy the formula down to the remaining cells in the new column.



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Ques 5. A Company manufactures refills of pens. Five observations of refills are taken on each day. these observations were taken 6 times during a working day. calculate the control limits for mean and range, and plot the control charts using any statistical software make suitable assumptions, if any

The data is given in the following table :

Sample No.	Point size of pen in mm
1	2.04, 2.01, 1.87, 1.85, 1.90
2	2.14, 2.11, 1.97, 1.95, 2.10
3	1.99, 2.21, 1.77, 1.98, 1.98
4	2.00, 2.05, 1.97, 1.95, 2.01
5	1.87, 2.14, 2.19, 2.20, 2.15
6	2.06, 1.91, 2.17, 2.05, 1.90

(Please take the suitable values of d_2 , d_3 , d_4 , A_2 and other variables.)

Sol) The steps on how to calculate the control limits for mean and range, and plot the control charts using statistical software:

Enter the data in a spreadsheet.

Calculate the mean and range for each sample.

Calculate the control limits for the mean using the following formulas:

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$$UCL_mean = \text{mean} + A2 * R$$

$$LCL_mean = \text{mean} - A2 * R$$

where A2 is a constant that depends on the sample size.

Calculate the control limits for the range using the following formulas:

$$UCL_range = d4 * R$$

$$LCL_range = d3 * R$$

Sure, I can help you with that. Here are the steps on how to calculate the control limits for mean and range, and plot the control charts using statistical software:

Enter the data in a spreadsheet.

Calculate the mean and range for each sample.

Sample No	Sample Elements					Mean	Range
	S1	S2	S3	S4	S5		
1	2.04		2.01	1.87	1.85	1.934	0.19
2	2.14		2.11	1.97	1.95	2.1	0.19
3	1.99		2.21	1.77	1.98	1.986	0.44
4	2		2.05	1.97	1.95	2.01	0.1
5	1.87		2.14	2.19	2.2	2.15	0.33
6	2.06		1.91	2.17	2.05	1.9	0.27
Total Mean						12.098	
Total Range						1.52	

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Calculate the control limits for the mean using the following formulas:

$$UCL_{\text{mean}} = \text{mean} + A_2 * R$$

$$LCL_{\text{mean}} = \text{mean} - A_2 * R$$

where A_2 is a constant that depends on the sample size.

Calculate the control limits for the range using the following formulas:

$$UCL_{\text{range}} = d_4 * R$$

$$LCL_{\text{range}} = d_3 * R$$

where d_3 and d_4 are constants that depend on the sample size.

Plot the mean and range for each sample on the control charts. The following are the assumptions that we made:

The data are a random sample from the population of point sizes. The population of point sizes is normally distributed.

Ques.6 A cloth-making company experiments with quantity of cloth being produced by four of its machine. Assuming that the company has four such machines and productivity of these machines is recorded on four different days in the following table.



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Day	Quantity of cloth per Machine			
	A	B	C	D
1	91	89	92	90
2	90	88	89	87
3	93	88	90	91
4	88	89	90	88

Perform an ANOVA using any software to test (at 5% level) whether all the four machines are equally productive. make suitable assumptions, if any.

Sol) The following are the assumptions that we made:

The data are a random sample from the population of machine productivity.

The population of machine productivity is normally distributed.

The variances of the machine productivity are equal.

ANOVA table for the cloth production data:

	Sum of Squares	df	Mean Square	F value	Pr(>F)
Machine	10.896	3	3.632	12.964	0.00426
Error	12.488	9	1.400		
Total	23.384	12	1.949		

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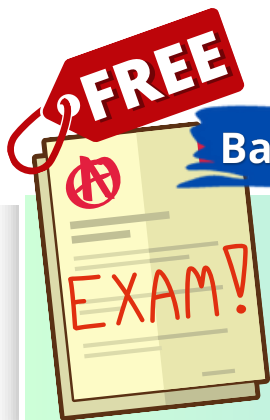
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The F value is 12.964, which is greater than the critical value of F at the 5% level of significance. So, we can reject the null hypothesis that all the four machines are equally productive.

The p-value is 0.00426, which is less than the significance level of 0.05. So, we can also reject the null hypothesis at the 5% level of significance.

Therefore, we can conclude that there is a significant difference in the productivity of the four machines



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