

# Unit 12 - Week 10

**Course outline**

How does an NPTEL online course work?

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## Assignment 10

The due date for submitting this assignment has passed. **Due on 2020-04-08, 23:59 IST.**  
As per our records you have not submitted this assignment.

1) Which of the following chart display process performance over time?

a. Pareto chart  
b. Run chart  
c. Control chart  
d. Flow Chart

a.  
 b.  
 c.  
 d.

No, the answer is incorrect.  
Score: 0  
Accepted Answers: b.

2) The length of industrial filters is a quality characteristic of interest. Thirty samples, each of size 5, are chosen from the process. The data yields an average length of 110 mm, with the process standard deviation estimated to be 4 mm. What is the probability of a type I error considering 3σ control limits?

a. 0.0228  
b. 0.0114  
c. 0.0057  
d. 0.0026

a.  
 b.  
 c.  
 d.

No, the answer is incorrect.  
Score: 0  
Accepted Answers: d.

3) Apollo health care facility is monitoring daily expenditures for a certain diagnosis-related group (DRG). Individual observations are selected. After 50 samples, the average and standard deviation of daily expenditures (in hundreds of rupees) are estimated to be 15 and 2, respectively. What is the value of ARL if Rules 1 and 2 are used simultaneously for the detection of out-of-control conditions? Assume independence of the rules. Assume that the average daily expenditures for the same DRG increases to ₹1750. Assume three-sigma control limits.

a. 27.96  
b. 25.74  
c. 24.94  
d. 21.57

a.  
 b.  
 c.  
 d.

No, the answer is incorrect.  
Score: 0  
Accepted Answers: c.

4) What is the use of cause and effect diagrams?

a. It is an effective tool that allows people to easily see the relationship between factors to study processes, situations, and for planning.  
b. It lets a process or procedure be understood easily.  
c. It takes a team to focus on the content of a problem.  
d. It takes samples of a process and detects possibility of process being out of control.

a.  
 b.  
 c.  
 d.

No, the answer is incorrect.  
Score: 0  
Accepted Answers: c.

5) A soft drink bottling company is interested in controlling its filling operation. Random samples of size 4 are selected and the fill weight is recorded. Table below shows the data for 24 samples. The specifications on fill weight are  $350 \pm 5$  grams (g). Daily production rate is 20,000 bottles. What will be the trial control limits for  $\bar{X}$ - and R – charts?

Sample	352	348	350	351	13	352	350	351	348
1	352	348	350	351	14	356	351	349	352
2	351	346	342	350	15	353	348	351	350
3	349	353	352	352	16	353	354	350	352
4	349	350	351	351	17	351	348	347	348
5	353	351	346	346	18	353	352	346	352
6	348	344	350	347	19	346	348	347	349
7	350	349	351	346	20	351	348	347	346
8	344	345	346	349	21	348	352	351	352
9	349	350	352	352	22	356	351	350	350
10	353	352	354	356	23	352	348	347	349
11	348	353	346	351	24	348	353	351	352
12									

a. 353.45, 346.404 for X-bar chart and 11.029, 0 for R-chart.  
b. 353.382, 346.472 for X-bar chart and 10.82, 0 for R-chart.  
c. 353.468, 346.286 for X-bar chart and 11.72, 0 for R-chart.  
d. None of the above

a.  
 b.  
 c.  
 d.

No, the answer is incorrect.  
Score: 0  
Accepted Answers: a.

6) Which of the following samples are out of the control in question number 5?

a. Sample 5 and 9  
b. Sample 9 and 11  
c. Sample 10 and 11  
d. Sample 11 and 19

a.  
 b.  
 c.  
 d.

No, the answer is incorrect.  
Score: 0  
Accepted Answers: b.

7) Taking the data of question number 5 and assuming the distribution of fill weights to be normal, how many bottles are nonconforming daily? Calculate on the basis of revised control limits.

a. 548  
b. 640  
c. 682  
d. 738

a.  
 b.  
 c.  
 d.

No, the answer is incorrect.  
Score: 0  
Accepted Answers: c.

8) The bore size on a component to be used in assembly is a critical dimension. Samples of size 4 are collected and the sample average diameter and range are calculated. After 25 samples, we have

$$\sum_{i=1}^{25} \bar{X}_i = 107.5, \sum_{i=1}^{25} \bar{R}_i = 12.5$$

The specifications on the bore size are  $4.4 \pm 0.2$  mm. The unit cost of rework and scrap are ₹168 and ₹52.5 respectively. The daily production rate is 1200. Find the daily cost of scrap and rework.

a. ₹6872.44 and ₹67752.50 respectively  
b. ₹6772.50 and ₹68725.44 respectively  
c. ₹6572.50 and ₹69725.72 respectively  
d. None of the above

a.  
 b.  
 c.  
 d.

No, the answer is incorrect.  
Score: 0  
Accepted Answers: b.

9) The time to be seated at a popular restaurant is of importance. Samples of five randomly selected customers are chosen and their average and range (in minutes) are calculated. After 30 such samples, the summary data values are

$$\sum_{i=1}^{30} \bar{X}_i = 306, \sum_{i=1}^{30} \bar{R}_i = 24$$

What will be the trial control limits for  $\bar{X}$ - chart for three sigma level?

a.  $UCL_{\bar{X}} = 11.175$  and  $LCL_{\bar{X}} = 9.790$   
b.  $UCL_{\bar{X}} = 10.377$  and  $LCL_{\bar{X}} = 9.589$   
c.  $UCL_{\bar{X}} = 10.662$  and  $LCL_{\bar{X}} = 9.738$   
d.  $UCL_{\bar{X}} = 10.891$  and  $LCL_{\bar{X}} = 9.543$

a.  
 b.  
 c.  
 d.

No, the answer is incorrect.  
Score: 0  
Accepted Answers: c.

10) The thickness of the plates on leaf spring is an important characteristic. Random samples of size 4 are selected, and the thickness is measured using an optical instrument. Table below shows the mean  $\bar{X}$  and standard deviation s for 20 samples. The specifications are  $38 \pm 4.5$  cm. What will be the trial control limits for s-chart?

Sample	Sample Mean, $\bar{X}$	Sample Standard Deviation, s	Sample	Sample Mean, $\bar{X}$	Sample Standard Deviation, s
1	36.4	4.6	11	36.7	5.3
2	35.8	3.7	12	35.2	3.5
3	37.3	5.2	13	38.8	4.7
4	33.9	4.3	14	39.0	5.6
5	37.8	4.4	15	35.5	5.0
6	36.1	3.9	16	37.1	4.1
7	38.6	5.0	17	38.3	5.6
8	39.4	6.1	18	39.2	4.8
9	34.4	4.1	19	36.8	4.7
10	39.5	5.8	20	37.7	5.4

a.  $UCL_s = 10.854$ , and  $LCL_s = 0$   
b.  $UCL_s = 10.577$ , and  $LCL_s = 0.579$   
c.  $UCL_s = 10.238$ , and  $LCL_s = 0$   
d.  $UCL_s = 9.596$ , and  $LCL_s = 0$

a.  
 b.  
 c.  
 d.

No, the answer is incorrect.  
Score: 0  
Accepted Answers: a.

11) Which type of control chart is most appropriate to monitor the satisfaction of customers at a restaurant where customers consider the quality of food and attitude of the server to be more important than the decor?

a. P chart  
b. np chart  
c. c chart  
d. U chart

a.  
 b.  
 c.  
 d.

No, the answer is incorrect.  
Score: 0  
Accepted Answers: d.

12) The number of customers who are not satisfied with the service provided in a retail store is found for 20 samples of size 100 and is shown in Table. Construct a control chart for the proportion of dis-satisfied customers. What are the revised control limits?

Sample	Number of Dissatisfied Customers	Sample	Number of Dissatisfied Customers
1	2	11	5
2	5	12	4
3	4	13	2
4	3	14	5
5	4	15	3
6	2	16	12
7	3	17	3
8	2	18	2
9	4	19	5
10	11	20	2

a.  $UCL_p = 0.1013$  and  $LCL_p = 0$   
b.  $UCL_p = 0.0871$  and  $LCL_p = 0$   
c.  $UCL_p = 0.1013$  and  $LCL_p = -0.0183$   
d.  $UCL_p = 0.0871$  and  $LCL_p = -0.0205$

a.  
 b.  
 c.  
 d.

No, the answer is incorrect.  
Score: 0  
Accepted Answers: b.

13) The number of dietary errors is found from a random sample of 100 trays chosen on a daily basis in a health care facility. The data for 25 such samples are shown in Table. Construct and appropriate control chart and chose the correct statement from below options.

Sample	Number of Dietary Errors	Sample	Number of Dietary Errors
1	9	14	8
2	6	15	8
3	4	16	7
4	7	17	6
5	5	18	4
6	6	19	12
7	16	20	7
8	8	21	6
9	7	22	8
10	9	23	6
11	3	24	8
12	6	25	5
13	10		

a. Sample number 10 is above UCL.  
b. The revised control limits are 0, 14.741.  
c. If no changes are made in the process, we would expect, on average, 6.875 dietary errors per 100 trays.  
d. None of the above

a.  
 b.  
 c.  
 d.

No, the answer is incorrect.  
Score: 0  
Accepted Answers: b.

14) The number of imperfections in bond paper produced by a paper mill is observed over a period of several days. Table shows the area inspected and the number of imperfections for 25 samples. Construct a control chart for the number of imperfections per square meter. Which samples are out of control?

Sample, i	Area Inspected (m <sup>2</sup> )	Imperfections	Sample, i	Area Inspected (m <sup>2</sup> )	Imperfections
1	150	6	14	300	8
2	100	8	15	300	12
3	200	5	16	200	4
4	150	4	17	150	6
5	250	10	18	200	7
6	100	11	19	150	14
7	150	3	20	100	4
8	200	5	21	100	8
9	300	10	22	200	9
10	250	10	23	300	12
11	100	5	24	250	7
12	200	4	25	200	5
13	250	12			

a. 6 and 13  
b. 13 and 19  
c. 6 and 19  
d. All samples are in control.

a.  
 b.  
 c.  
 d.

No, the answer is incorrect.  
Score: 0  
Accepted Answers: c.

15) A building contractor subcontracts to a local merchant, a job involving hanging wallpaper. To have an idea of the quality level of the merchant's work, the contractor randomly selects 300 m<sup>2</sup> and counts the number of blemishes. The total number of blemishes for 30 samples is 80. Construct the center-line and control limits for an appropriate chart. Check the reasonability for the contractor to set a goal of an average of 0.5 blemishes per 100 m<sup>2</sup>. What conclusions you draw?

a. The process average exceeds the goal value of 0.5.  
b. About 6.11% of the time the process will be deemed to be out of control.  
c. The process is totally incapable.  
d. None of these.

a.  
 b.  
 c.  
 d.

No, the answer is incorrect.  
Score: 0  
Accepted Answers: a.