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**Exam** : **MSC-431**

**Title** : **Lean Six Sigma Black Belt**

**Version** : **Demo**

1.You are about to run a t-test on shield thickness from 2 suppliers when you determine the data from one group is not normally distributed and cannot be transformed.

Your next step would be to?

- A. Use the Shapiro-Wilk test
- B. Proceed with the t-test
- C. Use a non - parametric test
- D. Discontinue the analysis

**Answer: C**

2.A manufacturing test process has 3 parallel machines performing exactly the same test. The data from this test process can be assumed to be normally distributed and the variances within each machine are the same.

To understand if there is a significant statistical difference in the average test value between machines, what test should be used?

- A. Kruskal - Wallis
- B. Chi-Square
- C. ANOVA
- D. Bartlett or Levene

**Answer: C**

3.Which of the following is a commonly used test that examines the association between multiple discrete variables?

- A. Kruskal-Wallace Test
- B. Shapiro-Wilkes Test
- C. Student's t-Test
- D. Chi-Square Test

**Answer: D**

4.An engineer is trying to increase a product characteristic mean from the current production 850 to above 855 . The standard deviation of the current process and the proposed process are assumed to be the same, Current = 7.7. The engineer wants to verify that the average difference of his new process as compared to the old process is statistically significant and is greater than 5 . What are the correct statistical hypotheses for this engineering problem?

- A.  $H_0: \mu_{New} - \mu_{Old} \leq 5$ ,  $H_a: \mu_{New} - \mu_{Old} > 5$
- B.  $H_0: \mu_{New} - \mu_{Old} = 5$ ,  $H_a: \mu_{New} - \mu_{Old} \neq 5$
- C.  $H_0: \mu_{New} = 850$ ,  $H_a: \mu_{New} > 850$
- D.  $H_0: \mu_{New} = 7.7$ ,  $H_a: \mu_{New} > 7.7$

**Answer: A**

5.Which of the following statistical procedures is appropriate when there is one continuous input variable variable (X) and one continuous output variable (Y)?

- A. T-test
- B. Chi-Square test
- C. One-Way ANOVA

D. Correlation

**Answer: D**

6. In a statistical analysis, the beta risk ( $\beta$ ) is:

- A. The probability of rejecting the null hypothesis when it is true
- B. Always equal to 0.10
- C. Driven by the cost of sampling
- D. The probability of failing to reject the null hypothesis when it is false

**Answer: D**

7. Sigma Saving and Loans processes loans and leases from around the world. The CEO wants to know if the current cycle time for processing is less than 9.5 days on average.

To test the claim that the average cycle time is less than 9.5 days, use:

- A. A 1-sample T-test
- B. A 2 sample T-test
- C. A One-way ANOVA
- D. A Chi-square test of means

**Answer: A**

8. Two different samples were pulled randomly from the same population. One sample is size  $n=10$  and the other is size  $n=100$ . A two-sided confidence interval for the mean was calculated separately for each.

How will the intervals compare?

- A. The confidence interval for size  $n=10$  will be smaller.
- B. The confidence interval for size  $n=10$  will be larger.
- C. The confidence intervals will be the same for both  $n=10$  and  $n=100$ .
- D. There is not enough information given.

**Answer: B**

9. The purpose of a screening experiment using DOE is to?

- A. Optimize the response by determining the best levels for the input factors
- B. Separating the "vital few from the trivial many"
- C. Comparing various levels for one factor
- D. Finding a set of levels for the inputs that produce a robust product

**Answer: B**

10. Based on the DOE results illustrated in the image below, and considering the Hierarchy of Effects, what terms should be left in the model? Use an alpha of 0.10.

Term	Effect	Coef	SE Coef	T	P
Constant		9.0530	1.243	7.29	0.000
Temp	4.9811	2.4905	1.243	2.00	0.076
Pressure	1.0190	0.5095	1.243	0.41	0.691
Time	6.5092	3.2546	1.243	2.62	0.028
Temp*Pressure	5.8832	2.9416	1.243	2.37	0.042
Temp*Time	2.8010	1.4005	1.243	1.13	0.289
Pressure*Time	3.0024	1.5012	1.243	1.21	0.258

- A. Temp, Time, Temp\*Pressure
- B. Temp, Time, Pressure, Temp\*Pressure
- C. Time, Temp + Pressure
- D. Temp, Time

**Answer: B**

11. What is the correct order of steps in an experiment (DOE)?

- Design the experiment & plan data collection
- Run the experiment and collect data
- State the problem or objective
- Analyze the results
- Interpret the results"

- A. 1,3,4,2,5
- B. 3, 1, 2,4,5
- C. 3,1,4,2,5
- D. 3, 1, 2, 5,4

**Answer: B**

12. Which of the following experimental designs could you run if you had 5 factors and a maximum of 21 experimental units?

- A. 26-2 with 6 center points
- B. 25 with 3 center points
- C. 25-1 with 5 center points
- D. 24 with 5 center points

**Answer: C**

Explanation:

13. The four basic objectives for experiments, which are a vital part of Lean Six Sigma, include Screening, Optimization, and which of the following?

- A. Result, Comparison
- B. Comparison, Robust Design
- C. Reduced Variance, Parsimony
- D. Comparison, Result

**Answer: B**

14. Experimental error includes the \_\_\_\_\_ in the experiment caused by uncontrolled and unknown nuisance factors. This is also called \_\_\_\_\_.

- A. Noise/pure error
- B. Noise/signal
- C. Signal/noise
- D. Pure error/signal

**Answer:** A

15. A Black Belt candidate has found that three process factors significantly affect process throughput and variability. He suspects that the influence of one of the factors is non-linear over the range of throughput. Which of the following tools should be used to determine the relationship between the factors and responses?

- A. Screening factorial experiment
- B. Response surface method (RSM) experiment
- C. Multiple linear regression analysis
- D. 2-Level Full Factorial experiment

**Answer:** B