



**EXIN
LSSA Lean Six Sigma**

GREEN BELT

Certified by


Sample Exam

Edition 202207

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Introduction

This is the EXIN LSSA Lean Six Sigma Green Belt (LSSGB.EN) sample exam. The Rules and Regulations for EXIN's examinations apply to this exam.

This exam consists of 60 multiple-choice questions. Each multiple-choice question has a number of possible answers, of which only one is correct.

The maximum number of points that can be obtained for this exam is 60. Each correct answer is worth 1 point. You need 38 points or more to pass the exam.

The time allowed for this exam is 180 minutes.

For this exam you are allowed to use a simple calculator.

You are allowed to use the exam literature and Minitab for this exam.

Good luck!

Sample exam

1 / 60

What does a problem description identify?

- A) The issue that the project team wants to improve
- B) The members of the improvement team
- C) The scope of the project
- D) The strategic reasons for the project

2 / 60

A team leader should give feedback to the team members.

What should he **not** do?

- A) Describe the overall progress and the barriers
- B) Explain why the given feedback is important
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3 / 60

In order to solve a problem correctly, which must occur **first**?

- A) The problem must be defined.
- B) The process map must be created.
- C) The measurement system must be analyzed.
- D) The relevant data must be gathered.

4 / 60

All five phases of a Lean or Six Sigma project are important and should be included in the project.

Which phase is the **most** important one to guarantee a successful and sustainable result?

- A) Measure
- B) Analyze
- C) Improve
- D) Control

5 / 60

Who is the right person to remove barriers arising in a Lean Six Sigma improvement project?

- A) The Champion
- B) The Master Black Belt
- C) The process owner (customer of the improvement project)
- D) The project leader

6 / 60

What do Lean and Six Sigma **not** share?

- A) A focus on continuous improvement
- B) A focus on customer satisfaction
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7 / 60

A company has just started a Lean Six Sigma initiative.

Which set of tools is the **best** to start with?

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- B) Lean tools, because they make problems visible and eliminate waste
- C) Six Sigma tools, because they are a more scientific method to solve problems
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8 / 60

What is the **most** important aspect of functional requirements?

- A) Describe a single, measurable performance
- B) Describe how a product or service should operate
- C) Provide upper and lower specification limits
- D) Reflect the Voice of the Customer (VOC)

9 / 60

Which is an example of continuous data?

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What is the sum of squared deviations from the sample mean divided by $n-1$?

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- D) Sample variance

12 / 60

Of a sample, all values are added together and this total is divided by the number of values.

What is the above the definition of?

- A) Mean
- B) Median
- C) Mode
- D) Sample Size

13 / 60

A supervisor asks employees to record the occurrences of ten different non-conformities. He is just interested in frequencies and wants to use a simple method.

Which method should he use?

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- B) Check sheet
- C) Pareto chart
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14 / 60

On a chicken farm, an automated egg inspector is used to sort out the eggs. The number of rejected eggs per 10 trays of 30 eggs is recorded.

What is this type of data called?

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15 / 60

What is the term for the value with the highest frequency in a data set?

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- B) Mean
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- D) Mode

16 / 60

An inline automated test device tests every part on a production line. The output of the device is "accept" or "reject".

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17 / 60

A process engineer has developed a Process FMEA for a boiler assembly line. The following ratings were determined for a specific cause of an assembly failure:

Severity = 9
Occurrence = 2
Detection = 5

What is the risk priority number (RPN) for this cause/failure mode?

- A) 10
- B) 18
- C) 45
- D) 90

18 / 60

There is a requirement for a Green Belt to perform a statistical test in order to demonstrate a difference in performance between two processes. The Belt states a null hypothesis and an alternative hypothesis. The Belt decides to use a confidence level $(1 - \alpha) = 0.95$, calculates the sample sizes needed and conducts the test. The calculated significance of the test statistic is $p = 0.72$.

Which should be the result of the statistical test and the conclusion about the processes?

- A) The null hypothesis is not rejected. There is not enough evidence that the processes are different.
- B) The null hypothesis is rejected. The processes are different.
- C) The alternative hypothesis is accepted. The processes are different.
- D) The alternative hypothesis is rejected. The processes are different.

19 / 60

What is the purpose of a statistical test?

- A) To calculate the significance of the hypothesis
- B) To prove that a stated null hypothesis is true
- C) To prove there is a difference between two or more samples
- D) To quantify the likelihood of a test outcome when we assume a null hypothesis is true

20 / 60

Which graph is **best** suited to visualize the stability of a process?

- A) Histogram
- B) Line plot
- C) Scatter plot
- D) Time series plot

21 / 60

When performing an FMEA, what must a Belt do?

- A) Calculate the expected number of failures in a given time interval
- B) Estimate the probability of product success
- C) Estimate the probability that the customer will detect the failure
- D) Identify the failure modes of the product and the causes of the failure

22 / 60

In a variance analysis, the following is found:

- the adjusted sum of squares of the factor is 24 with 2 degrees of freedom
- the adjusted sum of squares of the error is 6 with 18 degrees of freedom.

What is the R-square of this model in percentage?

- A) 6%
- B) 24%
- C) 50%
- D) 80%

23 / 60

What is the name of the procedure used to investigate two mutually exclusive statements about a population and in which information from a sample is used to make conclusions about the population?

- A) Correlation analysis
- B) Design of Experiment (DOE)
- C) Hypothesis testing
- D) Randomizing

24 / 60

What is the probability that the null hypothesis is actually true?

- A) 0 or 1, the hypothesis is either true or false
- B) Cannot say, it depends on the outcome of the test
- C) The Beta risk β
- D) The confidence level $(1-\alpha)$

25 / 60

When a Belt calculates a statistic based on sample measurements as an estimate for a population parameter, the Belt can also calculate, with specified confidence, an upper and lower limit within which the true population parameter lies.

What is this called?

- A) Confidence interval
- B) Confidence level
- C) Control limits
- D) Sample range

26 / 60

In a process of continuous improvement, graphical and statistical tools are used to analyze and control important process parameters.

What are these tools called?

- A) Analysis of Variance (ANOVA)
- B) Correlation analysis
- C) Design of Experiments (DOE)
- D) Statistical Process Control (SPC)

27 / 60

Which is **not** an effective analytical technique used to determine the root cause of a problem submitted for corrective action?

- A) Control charting
- B) Data analysis
- C) Operator observation
- D) Pareto analysis

28 / 60

Why is Design of Experiments (DOE) superior to the "One factor at a time" (OFAT) method?

- A) DOE is a statistical method, OFAT is not.
- B) DOE is randomized.
- C) DOE shows interactions between factors and is also very efficient.
- D) OFAT is not a structured method.

29 / 60

Which tool is **not** part of the 8-D problem-solving method?

- A) 5-Whys method
- B) Fishbone diagram
- C) Funnel method
- D) Is - Is-Not method

30 / 60

When a Belt runs a Design of Experiments (DOE), the experiment will show experimental error.

Which statement is true?

- A) If the degrees of freedom increase, the experimental error will decrease.
- B) The experimental error can be reduced only by improving the variability of the used materials.
- C) The experimental error is caused by interactions between two or more factors.
- D) The experimental error is due to the inherent variability within the factor-level combinations.

31 / 60

After returning from a two-week vacation a manager reviewed the Xbar and R charts that were maintained during the manager's absence. One of the Xbar charts shows the last 50 points to be very near the center line. In fact, they all seem to be within about one sigma of the center line.

What is the **best** explanation for this occurrence?

- A) It shows that the operators did a very good job keeping the process close to target.
- B) Somebody restored the original, wider control limit calculation.
- C) The process standard deviation has decreased and the control limits were not recomputed.
- D) There has been poor quality performance for quite some time.

32 / 60

At the early stages of the DMAIC project, the Voice of the Customer (VOC) shouted "safety" in every customer focus group, customer interview, and customer survey. The control plan addresses product performance in detail, but not product safety.

Should this control plan be implemented?

- A) Yes, safety is not a CTQ.
- B) Yes, the project leader is better informed than the customer, safety is no issue.
- C) No, the main CTQ requirement was not addressed in the control plan.
- D) No, the paperwork is not complete.

33 / 60

Please see the following list:

1. Poka-yoke
2. 5S
3. TPM
4. Kanban

Which techniques support operational control?

- A) 1, 2, 3 and 4
- B) 1, 2 and 4 only
- C) 2, 3, and 4 only
- D) 2 and 4 only

34 / 60

Please read the following statements:

1. Customer specifications can be used as control limits on control charts.
2. Control limits must reflect the process capability.
3. You cannot use control limits that are narrower than specification limits in the Control chart.

Which statements about Statistical Process Control (SPC) are true?

- A) Only 2 is true
- B) Both 1 and 3 are true
- C) Both 2 and 3 are true
- D) All the statements are true

35 / 60

Control chart rules are used to identify unusual events. Some rules indicate out-of-control situations.

Which rule gives a signal, but does **not** indicate an out-of-control situation?

- A) 1 point more than 3 standard deviations from center line
- B) 2 out of 3 points more than 2 standard deviations from center line (same side)
- C) 6 points in a row, all increasing or all decreasing
- D) 15 points in a row within 1 standard deviation of center line (either side)

36 / 60

A Lean Six Sigma Black Belt is developing a control plan.

Which tool does **not** belong to such a plan?

- A) FMEA
- B) Measurement system analysis
- C) Project selection
- D) Regression analysis

37 / 60

After installing a new production process, an employee reveals that there are Out-of-Control Action Plans (OCAPs) missing in the control plan.

Why are these OCAP's so important?

- A) They describe how the employee should react when the process goes out-of-control.
- B) They explain how to install the problem-solving team.
- C) They list which additional parameters the employee should measure.
- D) They tell the employee what to do with the produced items.

38 / 60

Which control chart is normally used when monitoring the number of defects per standard unit?

- A) C chart
- B) NP chart
- C) P chart
- D) U chart

39 / 60

Which chart is used to monitor the number of defects per part?

- A) I-MR chart
- B) NP chart
- C) P chart
- D) U chart

40 / 60

Please read the following characteristics:

1. Producing the right items
2. Delivering the right items
3. In the right amounts
4. At the right time

What are the characteristics of Just in time (JIT)?

- A) 1 and 3 only
- B) 2 and 3 only
- C) 1, 2 and 4 only
- D) 1, 2, 3 and 4

41 / 60

What is the **most** common technique used to reduce setup cycle time?

- A) Kaizen
- B) Six Sigma
- C) Single Minute Exchange of Die (SMED)
- D) Value Stream Mapping (VSM)

42 / 60

Assume the following information:

Customer demand: 80,000 pcs per month

Working days: 21 days per month

Available: 2 shifts of 8 hours per day

Breaks: 1 hour per shift per day

What is the takt time?

- A) 0.22 seconds per piece
- B) 6.62 seconds per piece
- C) 13.23 seconds per piece
- D) 15.12 seconds per piece

43 / 60

What needs to be done when the cycle time of a certain process step is far below takt time?

- A) Reduce customer demand
- B) Reduce cycle time
- C) Reduce the number of resources in this step
- D) Start a Lean improvement program

44 / 60

Please read the following characteristics:

1. Easy process control
2. Only produce what is needed
3. Instant availability of the products
4. Avoids overproduction

Which characteristics belong to pull?

- A) 1, 2, 3 only
- B) 1, 2, 4 only
- C) 1, 3, 4 only
- D) 2, 3, 4 only

45 / 60

When is an activity **not** value adding?

- A) When a product undergoes a final inspection
- B) When the activity contributes to the product or service
- C) When the activity is done correctly the first time
- D) When the customer is willing to pay for the activity

46 / 60

A Lean professional is asked to implement a Lean tool to improve the visibility of problems in a process.

Which tool is the **best** choice to start with?

- A) 5S
- B) 5 Whys
- C) Jidoka
- D) Kanban

47 / 60

Given the following output of a gage R&R study:

Source	% Study Variation
Total gage R&R	9.52
Repeatability	7.70
Producibility	5.59
Operator	5.59
Part-to-part	99.5
Total Variation	100.00

A few statements are made about this:

1. The %contribution of Total Gage R&R is about 10%.
2. There is no part * operator interaction.
3. The measurement system is classified as ideal.
4. Part-to-part is the largest cause of study variation.

What can be deduced from the study?

- A) 1, 2, 3 only
- B) 1, 2, 4 only
- C) 1, 3, 4 only
- D) 2, 3, 4 only

48 / 60

A supplier of wooden poles measures the length of poles produced by two employees Harry and Edward. The results are in the table below:

Employee	Mean	StdDev
Harry	1571	3.2
Edward	2569	2.8

They test the difference between the average lengths of the poles (two-sided with $\alpha = 0.05$) and assume equal variances.

What is the p-value and the conclusion?

- A) P-value = 0.045 and there is a significant difference in length.
- B) P-value = 0.045 and there is no significant difference in length.
- C) P-value = 0.056 and the difference in length is significant.
- D) P-value = 0.056 and they need more samples to demonstrate the difference.

49 / 60

Who makes the project charter in a Lean Six Sigma project?

- A) The Black Belt as board member
- B) The Champion
- C) The process owner
- D) The project leader

50 / 60

Using Lean Six Sigma methodology, what will be the failure rate for a company at 5 sigma level?

- A) 3.4 ppm
- B) 233 ppm
- C) 1350 ppm
- D) 6210 ppm

51 / 60

Given the information below and use a 5% significance level.

	Rocket A	Rocket B
Sample size	61 readings	45 readings
Variance	1.347 km ²	2.137 km ²

Does the range of rocket type B has a larger variance than the range of rocket type A?

- A) No significant difference, because $p\text{-value} < 0.05$
- B) No significant difference, because $p\text{-value} > 0.05$
- C) Significant difference, because $p\text{-value} < 0.05$
- D) Significant difference, because $p\text{-value} > 0.05$

52 / 60

What is **not** a benefit of a designed experiment?

- A) Analyzes different combinations of inputs
- B) Identifies main and interaction effects
- C) Preparation time is short
- D) Relatively low cost to implement

53 / 60

See the dataset below:

7, 6, 9, 8, 5, 7

What is the standard deviation?

- A) 1.2
- B) 1.4
- C) 1.9
- D) 2.0

54 / 60

In the following ANOVA table, a p-value is missing.

Source	SS	DF	MS	F	p
Material	327	3	109	4.36	?
Machine	180	5	36	1.44	0.32
Interaction	375	15	25	1.00	0.53
Error	175	7	25		
Total	1057	30			

What is the missing p-value?

- A) 0.03
- B) 0.05
- C) 0.07
- D) 0.10

55 / 60

On ten consecutive days, three parts were sampled from a process to analyze the stability of the process.

The specification range is 98 ± 6 .

Subgroup	Sample1	Sample2	Sample3
1	100	101	100
2	95	93	97
3	101	103	100
4	96	95	97
5	98	98	96
6	99	98	98
7	95	97	98
8	100	99	98
9	100	100	97
10	100	98	99

Which statement is true?

- A) The process is out-of-control. The control limits of the mean are at 95.9 and 100.5.
- B) The process is stable. The control limits of the mean are at 95.9 and 100.5.
- C) The variation and mean are both out-of-control.
- D) The variation and mean are stable in time.

56 / 60

An X-bar and Range control chart is based on a sample size of 4. An operator mistakenly samples 2 parts instead of 4. The average and the range of the two observations are plotted on the control chart.

Which statement **best** describes the effect of this mistake?

- A) Increase the probability that the R chart shows an out-of-control condition
- B) Increase the probability that the Xbar chart shows an out-of-control condition
- C) Observations from a sample of 2 will always be nearer the center lines of the charts
- D) Will not cause any misjudgments if the process is in control

57 / 60

When a Belt wants to visualize and examine the center and spread of the data.

What can the Belt **best** use?

- A) Box plot
- B) Interval plot
- C) Scatter plot
- D) Time Series Plot

58 / 60

Why should a project charter be set up?

- A) To describe the objective of the project
- B) To estimate the benefits
- C) To get a clear view on the problem
- D) All of the above

59 / 60

A 2-level full factorial design with 4 quantitative factors A, B, C and D is created. 4 center points and no replicates are used. The results of the analysis are below.

Factorial Regression: Response versus A; B; C; D

Analysis of Variance (ANOVA)

Source	DF	Adj ss	Adj ms	f-value	p-value
Model	11	2802.20	254.75	58.65	0.000
Linear	4	2701.25	675.31	155.47	0.000
A	1	256.00	256.00	58.94	0.000
B	1	2304.00	2304.00	530.42	0.000
C	1	20.25	20.25	4.66	0.063
D	1	121.00	121.00	27.86	0.001
2-Way Interactions	6	93.75	15.62	3.60	0.049
A*B	1	4.00	4.00	0.92	0.365
A*C	1	2.25	2.25	0.52	0.492
A*D	1	0.00	0.00	0.00	1.000
B*C	1	6.25	6.25	1.44	0.265
B*D	1	81.00	81.00	18.65	0.003
C*D	1	0.25	0.25	0.06	0.816
Curvature	1	7.20	7.20	1.66	0.234
Error	8	34.75	4.34		
Lack-of-Fit	5	6.00	1.20	0.13	0.976
Pure Error	3	28.75	9.58		
Total	19	2836.95			

What can be concluded from the results table using a 5% significant level?

- A) 3 main effects and the 2-way interaction B*D are significant.
- B) All response observations are unusual; no conclusions can be made from this experiment.
- C) Main effects A and C are significant.
- D) There is no significant main effect, just 2 way interactions B*D and A*C.

60 / 60

The following 10 measurements were provided by an appraiser.

The True Value is 0.80mm.

1 = 0.75	6 = 0.80
2 = 0.75	7 = 0.75
3 = 0.80	8 = 0.75
4 = 0.80	9 = 0.75
5 = 0.65	10 = 0.70

What is the bias measurement in this system?

- A) -0.05
- B) 0.05
- C) 12.50
- D) 13.33

Answer key

1 / 60

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- D) Correct.

18 / 60

There is a requirement for a Green Belt to perform a statistical test in order to demonstrate a difference in performance between two processes. The Belt states a null hypothesis and an alternative hypothesis. The Belt decides to use a confidence level $(1 - \alpha) = 0.95$, calculates the sample sizes needed and conducts the test. The calculated significance of the test statistic is $p = 0.72$.

Which should be the result of the statistical test and the conclusion about the processes?

- A) The null hypothesis is not rejected. There is not enough evidence that the processes are different.
- B) The null hypothesis is rejected. The processes are different.
- C) The alternative hypothesis is accepted. The processes are different.
- D) The alternative hypothesis is rejected. The processes are different.

- A) Correct.
- B) Incorrect.
- C) Incorrect.
- D) Incorrect.

19 / 60

What is the purpose of a statistical test?

- A) To calculate the significance of the hypothesis
- B) To prove that a stated null hypothesis is true
- C) To prove there is a difference between two or more samples
- D) To quantify the likelihood of a test outcome when we assume a null hypothesis is true

- A) Incorrect.
- B) Incorrect.
- C) Incorrect.
- D) Correct.

20 / 60

Which graph is **best** suited to visualize the stability of a process?

- A) Histogram
- B) Line plot
- C) Scatter plot
- D) Time series plot

- A) Incorrect.
- B) Incorrect.
- C) Incorrect.
- D) Correct.

21 / 60

When performing an FMEA, what must a Belt do?

- A) Calculate the expected number of failures in a given time interval
 - B) Estimate the probability of product success
 - C) Estimate the probability that the customer will detect the failure
 - D) Identify the failure modes of the product and the causes of the failure
-
- A) Incorrect.
 - B) Incorrect.
 - C) Incorrect.
 - D) Correct.

22 / 60

In a variance analysis, the following is found:

- the adjusted sum of squares of the factor is 24 with 2 degrees of freedom
- the adjusted sum of squares of the error is 6 with 18 degrees of freedom.

What is the R-square of this model in percentage?

- A) 6%
 - B) 24%
 - C) 50%
 - D) 80%
-
- A) Incorrect.
 - B) Incorrect.
 - C) Incorrect.
 - D) Correct.

23 / 60

What is the name of the procedure used to investigate two mutually exclusive statements about a population and in which information from a sample is used to make conclusions about the population?

- A) Correlation analysis
 - B) Design of Experiment (DOE)
 - C) Hypothesis testing
 - D) Randomizing
-
- A) Incorrect.
 - B) Incorrect.
 - C) Correct.
 - D) Incorrect.

24 / 60

What is the probability that the null hypothesis is actually true?

- A) 0 or 1, the hypothesis is either true or false
- B) Cannot say, it depends on the outcome of the test
- C) The Beta risk β
- D) The confidence level $(1-\alpha)$

- A) Correct.
- B) Incorrect.
- C) Incorrect.
- D) Incorrect.

25 / 60

When a Belt calculates a statistic based on sample measurements as an estimate for a population parameter, the Belt can also calculate, with specified confidence, an upper and lower limit within which the true population parameter lies.

What is this called?

- A) Confidence interval
- B) Confidence level
- C) Control limits
- D) Sample range

- A) Correct.
- B) Incorrect.
- C) Incorrect.
- D) Incorrect.

26 / 60

In a process of continuous improvement, graphical and statistical tools are used to analyze and control important process parameters.

What are these tools called?

- A) Analysis of Variance (ANOVA)
- B) Correlation analysis
- C) Design of Experiments (DOE)
- D) Statistical Process Control (SPC)

- A) Incorrect.
- B) Incorrect.
- C) Incorrect.
- D) Correct.

27 / 60

Which is **not** an effective analytical technique used to determine the root cause of a problem submitted for corrective action?

- A) Control charting
- B) Data analysis
- C) Operator observation
- D) Pareto analysis

- A) Incorrect.
- B) Incorrect.
- C) Correct.
- D) Incorrect.

28 / 60

Why is Design of Experiments (DOE) superior to the "One factor at a time" (OFAT) method?

- A) DOE is a statistical method, OFAT is not.
- B) DOE is randomized.
- C) DOE shows interactions between factors and is also very efficient.
- D) OFAT is not a structured method.

- A) Incorrect.
- B) Incorrect.
- C) Correct.
- D) Incorrect.

29 / 60

Which tool is **not** part of the 8-D problem-solving method?

- A) 5-Whys method
- B) Fishbone diagram
- C) Funnel method
- D) Is - Is-Not method

- A) Incorrect.
- B) Incorrect.
- C) Correct.
- D) Incorrect.

30 / 60

When a Belt runs a Design of Experiments (DOE), the experiment will show experimental error.

Which statement is true?

- A) If the degrees of freedom increase, the experimental error will decrease.
- B) The experimental error can be reduced only by improving the variability of the used materials.
- C) The experimental error is caused by interactions between two or more factors.
- D) The experimental error is due to the inherent variability within the factor-level combinations.

- A) Incorrect.
- B) Incorrect.
- C) Incorrect.
- D) Correct.

31 / 60

After returning from a two-week vacation a manager reviewed the Xbar and R charts that were maintained during the manager's absence. One of the Xbar charts shows the last 50 points to be very near the center line. In fact, they all seem to be within about one sigma of the center line.

What is the **best** explanation for this occurrence?

- A) It shows that the operators did a very good job keeping the process close to target.
- B) Somebody restored the original, wider control limit calculation.
- C) The process standard deviation has decreased and the control limits were not recomputed.
- D) There has been poor quality performance for quite some time.

- A) Incorrect.
- B) Incorrect.
- C) Correct.
- D) Incorrect.

32 / 60

At the early stages of the DMAIC project, the Voice of the Customer (VOC) shouted "safety" in every customer focus group, customer interview, and customer survey. The control plan addresses product performance in detail, but not product safety.

Should this control plan be implemented?

- A) Yes, safety is not a CTQ.
- B) Yes, the project leader is better informed than the customer, safety is no issue.
- C) No, the main CTQ requirement was not addressed in the control plan.
- D) No, the paperwork is not complete.

- A) Incorrect.
- B) Incorrect.
- C) Correct.
- D) Incorrect.

33 / 60

Please see the following list:

1. Poka-yoke
2. 5S
3. TPM
4. Kanban

Which techniques support operational control?

- A)** 1, 2, 3 and 4
- B)** 1, 2 and 4 only
- C)** 2, 3, and 4 only
- D)** 2 and 4 only

- A)** Correct.
- B)** Incorrect.
- C)** Incorrect.
- D)** Incorrect.

34 / 60

Please read the following statements:

1. Customer specifications can be used as control limits on control charts.
2. Control limits must reflect the process capability.
3. You cannot use control limits that are narrower than specification limits in the Control chart.

Which statements about Statistical Process Control (SPC) are true?

- A)** Only 2 is true
- B)** Both 1 and 3 are true
- C)** Both 2 and 3 are true
- D)** All the statements are true

- A)** Correct.
- B)** Incorrect.
- C)** Incorrect.
- D)** Incorrect.

35 / 60

Control chart rules are used to identify unusual events. Some rules indicate out-of-control situations.

Which rule gives a signal, but does **not** indicate an out-of-control situation?

- A) 1 point more than 3 standard deviations from center line
- B) 2 out of 3 points more than 2 standard deviations from center line (same side)
- C) 6 points in a row, all increasing or all decreasing
- D) 15 points in a row within 1 standard deviation of center line (either side)

- A) Incorrect.
- B) Incorrect.
- C) Incorrect.
- D) Correct.

36 / 60

A Lean Six Sigma Black Belt is developing a control plan.

Which tool does **not** belong to such a plan?

- A) FMEA
- B) Measurement system analysis
- C) Project selection
- D) Regression analysis

- A) Incorrect.
- B) Incorrect.
- C) Correct.
- D) Incorrect.

37 / 60

After installing a new production process, an employee reveals that there are Out-of-Control Action Plans (OCAPs) missing in the control plan.

Why are these OCAP's so important?

- A) They describe how the employee should react when the process goes out-of-control.
- B) They explain how to install the problem-solving team.
- C) They list which additional parameters the employee should measure.
- D) They tell the employee what to do with the produced items.

- A) Correct.
- B) Incorrect.
- C) Incorrect.
- D) Incorrect.

38 / 60

Which control chart is normally used when monitoring the number of defects per standard unit?

- A) C chart
- B) NP chart
- C) P chart
- D) U chart

- A) Incorrect.
- B) Incorrect.
- C) Incorrect.
- D) Correct.

39 / 60

Which chart is used to monitor the number of defects per part?

- A) I-MR chart
- B) NP chart
- C) P chart
- D) U chart

- A) Incorrect.
- B) Incorrect.
- C) Incorrect.
- D) Correct.

40 / 60

Please read the following characteristics:

1. Producing the right items
2. Delivering the right items
3. In the right amounts
4. At the right time

What are the characteristics of Just in time (JIT)?

- A) 1 and 3 only
- B) 2 and 3 only
- C) 1, 2 and 4 only
- D) 1, 2, 3 and 4

- A) Incorrect.
- B) Incorrect.
- C) Incorrect.
- D) Correct.

41 / 60

What is the **most** common technique used to reduce setup cycle time?

- A) Kaizen
- B) Six Sigma
- C) Single Minute Exchange of Die (SMED)
- D) Value Stream Mapping (VSM)

- A) Incorrect.
- B) Incorrect.
- C) Correct.
- D) Incorrect.

42 / 60

Assume the following information:

Customer demand: 80,000 pcs per month
Working days: 21 days per month
Available: 2 shifts of 8 hours per day
Breaks: 1 hour per shift per day

What is the takt time?

- A) 0.22 seconds per piece
- B) 6.62 seconds per piece
- C) 13.23 seconds per piece
- D) 15.12 seconds per piece

- A) Incorrect.
- B) Incorrect.
- C) Correct.
- D) Incorrect.

43 / 60

What needs to be done when the cycle time of a certain process step is far below takt time?

- A) Reduce customer demand
- B) Reduce cycle time
- C) Reduce the number of resources in this step
- D) Start a Lean improvement program

- A) Incorrect.
- B) Incorrect.
- C) Correct.
- D) Incorrect.

44 / 60

Please read the following characteristics:

1. Easy process control
2. Only produce what is needed
3. Instant availability of the products
4. Avoids overproduction

Which characteristics belong to pull?

- A) 1, 2, 3 only
- B) 1, 2, 4 only
- C) 1, 3, 4 only
- D) 2, 3, 4 only

- A) Incorrect.
- B) Correct.
- C) Incorrect.
- D) Incorrect.

45 / 60

When is an activity **not** value adding?

- A) When a product undergoes a final inspection
- B) When the activity contributes to the product or service
- C) When the activity is done correctly the first time
- D) When the customer is willing to pay for the activity

- A) Correct.
- B) Incorrect.
- C) Incorrect.
- D) Incorrect.

46 / 60

A Lean professional is asked to implement a Lean tool to improve the visibility of problems in a process.

Which tool is the **best** choice to start with?

- A) 5S
- B) 5 Whys
- C) Jidoka
- D) Kanban

- A) Correct.
- B) Incorrect.
- C) Incorrect.
- D) Incorrect.

47 / 60

Given the following output of a gage R&R study:

Source	% Study Variation
Total gage R&R	9.52
Repeatability	7.70
Producibility	5.59
Operator	5.59
Part-to-part	99.5
Total Variation	100.00

A few statements are made about this:

1. The %contribution of Total Gage R&R is about 10%.
2. There is no part * operator interaction.
3. The measurement system is classified as ideal.
4. Part-to-part is the largest cause of study variation.

What can be deduced from the study?

- A) 1, 2, 3 only
- B) 1, 2, 4 only
- C) 1, 3, 4 only
- D) 2, 3, 4 only

- A) Incorrect.
- B) Incorrect.
- C) Incorrect.
- D) Correct.

48 / 60

A supplier of wooden poles measures the length of poles produced by two employees Harry and Edward. The results are in the table below:

Employee	Mean	StdDev
Harry	1571	3.2
Edward	2569	2.8

They test the difference between the average lengths of the poles (two-sided with $\alpha = 0.05$) and assume equal variances.

What is the p-value and the conclusion?

- A) P-value = 0.045 and there is a significant difference in length.
 - B) P-value = 0.045 and there is no significant difference in length.
 - C) P-value = 0.056 and the difference in length is significant.
 - D) P-value = 0.056 and they need more samples to demonstrate the difference.
- A) Correct.
 - B) Incorrect.
 - C) Incorrect.
 - D) Incorrect.

49 / 60

Who makes the project charter in a Lean Six Sigma project?

- A) The Black Belt as board member
 - B) The Champion
 - C) The process owner
 - D) The project leader
- A) Incorrect.
 - B) Incorrect.
 - C) Incorrect.
 - D) Correct.

50 / 60

Using Lean Six Sigma methodology, what will be the failure rate for a company at 5 sigma level?

- A) 3.4 ppm
 - B) 233 ppm
 - C) 1350 ppm
 - D) 6210 ppm
- A) Incorrect.
 - B) Correct.
 - C) Incorrect.
 - D) Incorrect.

51 / 60

Given the information below and use a 5% significance level.

	Rocket A	Rocket B
Sample size	61 readings	45 readings
Variance	1.347 km ²	2.137 km ²

Does the range of rocket type B has a larger variance than the range of rocket type A?

- A) No significant difference, because p-value < 0.05>
- B) No significant difference, because p-value > 0.05
- C) Significant difference, because p-value < 0.05>
- D) Significant difference, because p-value > 0.05

- A) Incorrect.
- B) Incorrect.
- C) Correct.
- D) Incorrect.

52 / 60

What is **not** a benefit of a designed experiment?

- A) Analyzes different combinations of inputs
- B) Identifies main and interaction effects
- C) Preparation time is short
- D) Relatively low cost to implement

- A) Incorrect.
- B) Incorrect.
- C) Correct.
- D) Incorrect.

53 / 60

See the dataset below:

7, 6, 9, 8, 5, 7

What is the standard deviation?

- A) 1.2
- B) 1.4
- C) 1.9
- D) 2.0

- A) Incorrect.
- B) Correct.
- C) Incorrect.
- D) Incorrect.

54 / 60

In the following ANOVA table, a p-value is missing.

Source	SS	DF	MS	F	p
Material	327	3	109	4.36	?
Machine	180	5	36	1.44	0.32
Interaction	375	15	25	1.00	0.53
Error	175	7	25		
Total	1057	30			

What is the missing p-value?

- A) 0.03
 - B) 0.05
 - C) 0.07
 - D) 0.10
-
- A) Incorrect.
 - B) Correct.
 - C) Incorrect.
 - D) Incorrect.

55 / 60

On ten consecutive days, three parts were sampled from a process to analyze the stability of the process.

The specification range is 98 ± 6 .

Subgroup	Sample1	Sample2	Sample3
1	100	101	100
2	95	93	97
3	101	103	100
4	96	95	97
5	98	98	96
6	99	98	98
7	95	97	98
8	100	99	98
9	100	100	97
10	100	98	99

Which statement is true?

- A) The process is out-of-control. The control limits of the mean are at 95.9 and 100.5.
- B) The process is stable. The control limits of the mean are at 95.9 and 100.5.
- C) The variation and mean are both out-of-control.
- D) The variation and mean are stable in time.

- A) Correct.
- B) Incorrect.
- C) Incorrect.
- D) Incorrect.

56 / 60

An X-bar and Range control chart is based on a sample size of 4. An operator mistakenly samples 2 parts instead of 4. The average and the range of the two observations are plotted on the control chart.

Which statement **best** describes the effect of this mistake?

- A) Increase the probability that the R chart shows an out-of-control condition
- B) Increase the probability that the Xbar chart shows an out-of-control condition
- C) Observations from a sample of 2 will always be nearer the center lines of the charts
- D) Will not cause any misjudgments if the process is in control

- A) Incorrect.
- B) Correct.
- C) Incorrect.
- D) Incorrect.

57 / 60

When a Belt wants to visualize and examine the center and spread of the data.

What can the Belt **best** use?

- A) Box plot
- B) Interval plot
- C) Scatter plot
- D) Time Series Plot

- A) Correct.
- B) Incorrect.
- C) Incorrect.
- D) Incorrect.

58 / 60

Why should a project charter be set up?

- A) To describe the objective of the project
- B) To estimate the benefits
- C) To get a clear view on the problem
- D) All of the above

- A) Incorrect.
- B) Incorrect.
- C) Incorrect.
- D) Correct.

59 / 60

A 2-level full factorial design with 4 quantitative factors A, B, C and D is created. 4 center points and no replicates are used. The results of the analysis are below.

Factorial Regression: Response versus A; B; C; D

Analysis of Variance (ANOVA)

Source	DF	Adj ss	Adj ms	f-value	p-value
Model	11	2802.20	254.75	58.65	0.000
Linear	4	2701.25	675.31	155.47	0.000
A	1	256.00	256.00	58.94	0.000
B	1	2304.00	2304.00	530.42	0.000
C	1	20.25	20.25	4.66	0.063
D	1	121.00	121.00	27.86	0.001
2-Way Interactions	6	93.75	15.62	3.60	0.049
A*B	1	4.00	4.00	0.92	0.365
A*C	1	2.25	2.25	0.52	0.492
A*D	1	0.00	0.00	0.00	1.000
B*C	1	6.25	6.25	1.44	0.265
B*D	1	81.00	81.00	18.65	0.003
C*D	1	0.25	0.25	0.06	0.816
Curvature	1	7.20	7.20	1.66	0.234
Error	8	34.75	4.34		
Lack-of-Fit	5	6.00	1.20	0.13	0.976
Pure Error	3	28.75	9.58		
Total	19	2836.95			

What can be concluded from the results table using a 5% significant level?

- A) 3 main effects and the 2-way interaction B*D are significant.
 - B) All response observations are unusual; no conclusions can be made from this experiment.
 - C) Main effects A and C are significant.
 - D) There is no significant main effect, just 2 way interactions B*D and A*C.
-
- A) Correct.
 - B) Incorrect.
 - C) Incorrect.
 - D) Incorrect.

60 / 60

The following 10 measurements were provided by an appraiser.

The True Value is 0.80mm.

1 = 0.75	6 = 0.80
2 = 0.75	7 = 0.75
3 = 0.80	8 = 0.75
4 = 0.80	9 = 0.75
5 = 0.65	10 = 0.70

What is the bias measurement in this system?

- A) -0.05
- B) 0.05
- C) 12.50
- D) 13.33

- A) Correct.
- B) Incorrect.
- C) Incorrect.
- D) Incorrect.

Evaluation

The table below shows the correct answers to the questions in this sample exam.

Question	Answer	Question	Answer
1	A	31	C
2	C	32	C
3	A	33	A
4	D	34	A
5	A	35	D
6	D	36	C
7	B	37	A
8	D	38	D
9	B	39	D
10	B	40	D
11	D	41	C
12	A	42	C
13	B	43	C
14	C	44	B
15	D	45	A
16	A	46	A
17	D	47	D
18	A	48	A
19	D	49	D
20	D	50	B
21	D	51	C
22	D	52	C
23	C	53	B
24	A	54	B
25	A	55	A
26	D	56	B
27	C	57	A
28	C	58	D
29	C	59	A
30	D	60	A



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