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# IASSC Certified Lean Six Sigma Green Belt

## Six Sigma ICGB

**Version Demo**

**Total Demo Questions: 16**

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# Topic Break Down

| Topic | No. of Questions |
|---|---|
| Topic 1, Define Phase | 17 |
| Topic 2, Measure Phase | 52 |
| Topic 3, Analyze Phase | 48 |
| Topic 4, Improve Phase | 28 |
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QUESTION NO: 1

Before conducting a designed experiment, which of these actions are appropriate? (Note: There are 3 correct answers).

**A.** Define the response variable to be measured

**B.** Select safe and practical factor levels

**C.** Consider replication of treatment combinations

**D.** Change factor settings without recording them

**E.** Use only one factor setting for every experimental run

**ANSWER: A B C**

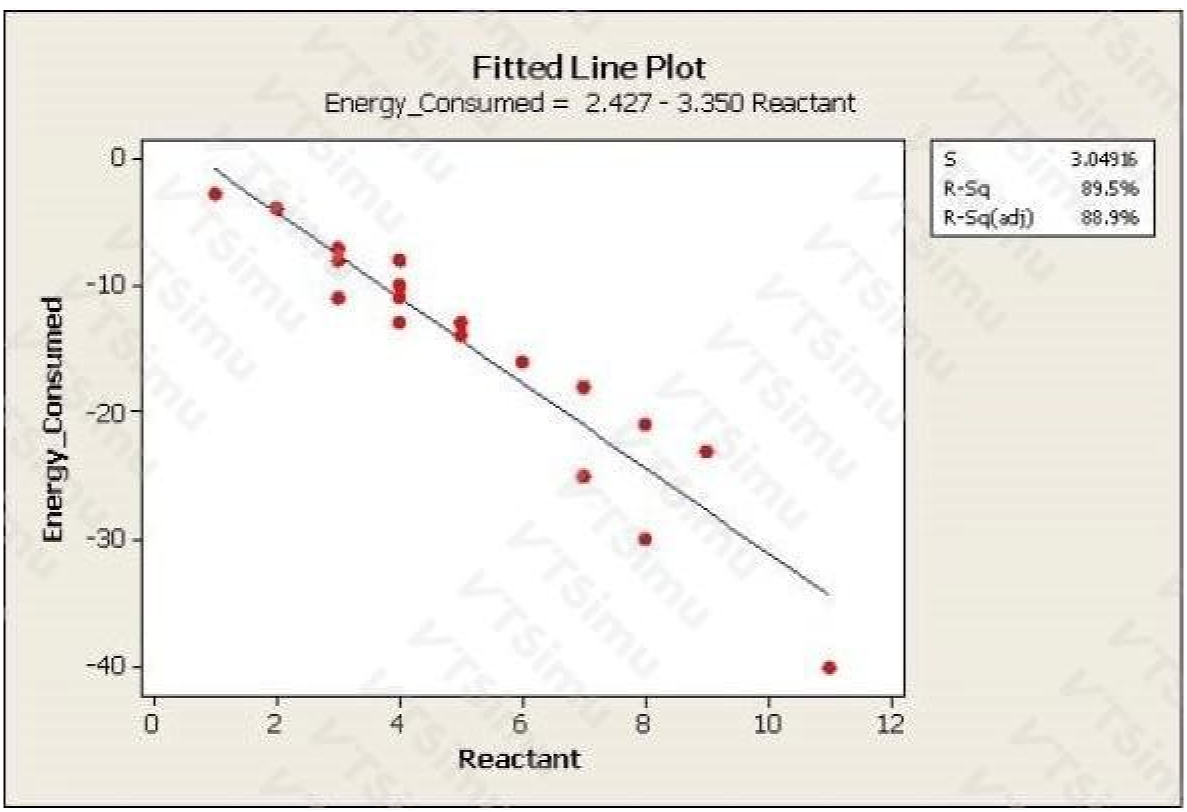
**Explanation:**

Defining the response variable, selecting factor levels that are safe and practical, and considering replication are appropriate preparations for a designed experiment. The response variable establishes what outcome will be measured. Factor levels define the controlled conditions to be studied and must be feasible for the process. Replication provides additional information about experimental error and improves the ability to distinguish factor effects from ordinary variation.

Randomizing the run order is also generally an important DOE practice, but changing several factors without recording their settings prevents valid analysis. A designed experiment requires planned, controlled changes to inputs so their effects on the response can be evaluated objectively. NIST describes experimentation as systematically varying process inputs and observing their effect on one or more responses. See NIST/SEMATECH: Process Improvement and DOE.

**QUESTION NO: 2**

Which statement(s) are true about the Fitted Line Plot shown here? (Note: There are 2 correct answers).




**A.** When Reactant increases, the Energy Consumed increases.

**B.** The slope of the equation is a positive 130.5.

**C.** The predicted output Y is close to -18 when the Reactant level is set to 6.

**D.** Over 85 % of the variation of the Energy Consumed is explained by the Reactant via this Linear Regression.

**ANSWER: C D**

**Explanation:**

The statement “The predicted output Y is close to -18 when the Reactant level is set to 6.” is supported by substituting a Reactant value of 6 into the fitted regression equation shown on the plot. The resulting fitted, or predicted, Energy Consumed value is approximately -18. A fitted-line equation estimates the mean response at a given input value; it is not necessarily the value that every individual observation will take. This is the standard interpretation of the regression line described in the NIST linear least-squares regression guidance.

The statement “Over 85 % of the variation of the Energy Consumed is explained by the Reactant via this Linear Regression.” is also correct because the plot’s R-squared value is greater than 85%. R-squared expresses the proportion of variation in the response accounted for by the fitted model, so an R-squared above 0.85 means that more than 85% of the observed variation in Energy Consumed is explained by its linear relationship with Reactant. This is the conventional interpretation of R-squared in regression output, as summarized by NIST’s regression model documentation.

## QUESTION NO: 3

Significant variation in process performance is a consequence of several causes that can be classified using which of the terminologies shown. (Note: There are 2 correct answers).

**A.** Common

**B.** Random

**C.** Uneducated

**D.** Special

**E.** Vital

**ANSWER: A D**

**Explanation:**

In statistical process control, process variation is conventionally classified as **common-cause variation** or **special-cause variation**. Common causes are the many routine, inherent sources of fluctuation built into the current process design, methods, materials, environment, measurement system, and operating conditions. Their combined effect establishes the process’s typical, predictable level of variation when the process is stable. Improving this kind of variation generally requires changing the process or system itself.

Special causes are identifiable, nonroutine influences that are not part of the process’s usual operating pattern. They can create unusual shifts, trends, cycles, or individual points on a control chart that signal the process may no longer be statistically stable. Lean Six Sigma practitioners use control charts to distinguish these two categories because the appropriate response depends on whether variation is inherent to the system or attributable to a particular event or condition. This terminology originates in the statistical-process-control principles associated with W. Edwards Deming and is central to the Analyze and Control phases of DMAIC. The American Society for Quality describes these categories in its variation resource, and additional SPC context is available in the NIST/SEMATECH e-Handbook on control charts.

## QUESTION NO: 4

When two Inputs have an impact on the Output together yet seem to have no or little impact on their own this is called a/an ________________.

**A.** Interaction

**B.** Oddity

**C.** Coincidence

**D.** Impossibility

**ANSWER: A**

**Explanation:**

An **Interaction** occurs when the effect of one input factor on an output depends on the setting or level of another input factor. Thus, neither input may display a meaningful main effect when considered by itself, while their combined settings produce a substantial change in the process output. This is a core concept in Design of Experiments, a Green Belt tool used to identify and quantify the relationships between process inputs (the Xs) and a response (the Y). For example, a process may perform acceptably at most combinations of temperature and pressure, but yield a markedly different result when both are high. The important finding is not simply that two factors are present; it is that their effects are conditional upon one another. Factorial experiments are particularly valuable because they allow teams to estimate interaction effects in addition to main effects, helping avoid conclusions based only on individual-factor analysis. NIST describes interaction as the situation in which the effect of one factor changes across the levels of another factor. See the NIST Engineering Statistics Handbook discussion of interaction effects and the NIST overview of factorial designs.

## QUESTION NO: 5

A team uses a scatter plot to examine the relationship between machine temperature and defect rate. The plotted points show a strong upward pattern. What conclusion is most appropriate?

**A.** Machine temperature and defect rate are positively associated

**B.** Machine temperature is proven to cause every defect

**C.** The defect rate is independent of machine temperature

**D.** The data must follow a normal distribution

**ANSWER: A**

**Explanation:**

The most appropriate conclusion is that **machine temperature and defect rate are positively associated**. A strong upward pattern on a scatter plot indicates that higher values of one variable tend to occur with higher values of the other variable. The plot is useful for identifying a potential relationship that merits additional investigation.

The observed association does not, by itself, prove that increasing temperature causes defects. Other factors may be related to both variables, and causal conclusions generally require process knowledge, confirmation data, or a controlled experiment. NIST describes scatter plots as graphical tools for examining the relationship between two quantitative variables. See NIST: Scatter Plot.

## QUESTION NO: 6

Examples of Mistake Proofing for a laptop computer include which of these? (Note: There are 2 correct answers).

**A.** USB connection for a mouse

**B.** Open/Close button for CD Drive

**C.** Battery alignment pins

**D.** On/Off switch for computer

**ANSWER: A C**

**Explanation:**

Mistake proofing, also called poka-yoke, is the use of a product or process feature that prevents an error, makes an error immediately apparent, or ensures that an incorrect action cannot be completed. USB connection for a mouse is a familiar product-design example because the plug and port geometry guide the connector into its intended mating position and prevent insertion in an incompatible orientation or interface. The connection design therefore reduces the likelihood of an incorrect setup action before the mouse is used.

Battery alignment pins are also a direct physical poka-yoke. Their placement and shape constrain how a removable battery can fit into its compartment, helping ensure that the battery seats in the required position and that its electrical contacts align correctly. This is an especially strong form of error prevention because the physical design controls the action rather than relying on the user to remember instructions or inspect the installation afterward. In Lean Six Sigma, such built-in controls are preferred where practical because they reduce opportunities for defects at their source. ASQ describes poka-yoke as mistake-proofing intended to prevent errors or make them readily detectable: ASQ Mistake Proofing. Additional Lean Six Sigma poka-yoke guidance is available from iSixSigma.

## QUESTION NO: 7

Inferential Statistics is largely about Significance. There are both Practical and _______________ Significance to consider during an analysis of data in a Lean Six Sigma project.

**A.** Problematic

**B.** Impractical

**C.** Usable

**D.** Statistical

## ANSWER: D

**Explanation:**

Statistical significance is the appropriate complement to practical significance in Lean Six Sigma data analysis. Statistical significance addresses whether an observed difference, relationship, or effect is unlikely to have occurred solely through random sampling variation under a stated null hypothesis. It is commonly evaluated with a hypothesis test and its p-value, using a preselected significance level such as 0.05. In a DMAIC project, this helps the team decide whether the evidence supports a real process-related effect rather than chance noise.

Practical significance addresses a separate but essential question: whether the size of that statistically supported effect is meaningful enough to matter to customers, process performance, cost, risk, or the project's business objective. For example, a very small improvement can be statistically significant when a large sample is used, while still being too small to justify implementation. Green Belts should therefore consider both the strength of statistical evidence and the practical magnitude of the result when drawing conclusions and selecting improvements. The American Society for Quality discusses statistical significance in its hypothesis-testing resource, and NIST provides guidance on hypothesis tests and p-values in its Engineering Statistics Handbook.

## QUESTION NO: 8

A customer-service operation receives 480 requests during an 8-hour day. If the operation has 24,000 seconds of available work time after planned breaks, what is the takt time in seconds per request?

**A.** 25

**B.** 50

**C.** 60

**D.** 480

## ANSWER: B

**Explanation:**

**50** is correct because takt time is calculated by dividing available production time by customer demand during the same period. The calculation is 24,000 available seconds divided by 480 requests, which equals 50 seconds per request.

Takt time establishes the pace required to satisfy customer demand. It is not the same as cycle time: cycle time is the actual time required for a process to complete a unit, while takt time is the required rate of completion based on demand. Comparing the two helps a Lean team identify whether capacity and work balance are sufficient to meet customer needs. See Lean Enterprise Institute: Takt Time.

## QUESTION NO: 9

A Six Sigma tool that helps to screen factors by using graphical techniques to logically subgroup multiple discrete X's plotted against a continuous Y is known as a _____________Chart.

**A.** SIPOC

**B.** Multi-Vari

**C.** Box Plot

**D.** Whisker

## ANSWER: B

**Explanation:**

Multi-Vari is correct because a Multi-Vari Chart is a Lean Six Sigma graphical analysis tool used to expose and screen potential sources of variation in a continuous response, Y. It displays measurements in deliberately structured subgroups so that patterns associated with discrete input factors, Xs, can be seen visually. For example, a team may subgroup a quality characteristic by machine, operator, cavity, shift, location, or time period. The resulting display helps the team compare variation within a unit, between units, and over time, highlighting where meaningful differences may be present and where further investigation should focus.

In the Analyze phase, this makes the Multi-Vari Chart especially useful as an initial, data-driven way to prioritize suspected causes before conducting more formal statistical testing or designed experimentation. The chart supports the Six Sigma principle of separating and understanding sources of process variation rather than relying solely on assumptions about causes. ASQ describes multivari charts as tools for analyzing variation across categories and time, while NIST discusses graphical methods for examining relationships and structure in process data. See ASQ's Multivari Chart resource and the NIST Engineering Statistics Handbook.

## QUESTION NO: 10

Which of these activities are considered non-value-added from the customer perspective? (Note: There are 3 correct answers).

**A.** Rework of an incorrectly completed order

**B.** Waiting for a manager approval

**C.** Moving material between distant work areas

**D.** Assembling a product to customer requirements

**E.** Required verification for regulatory compliance

## ANSWER: A B C

**Explanation:**

Rework, waiting for approval, and moving material between work areas are non-value-added activities because they consume time or resources without changing the product or service in a way for which the customer is willing to pay. Rework corrects a defect that should not have occurred, waiting delays the flow of work, and unnecessary transportation does not transform the item in a manner valued by the customer.

Lean identifies these activities as forms of waste. In contrast, assembling a product to required specifications may directly transform inputs into an output the customer values, while required regulatory verification can be necessary even if the customer does not directly perceive it as value-added. The Lean Enterprise Institute describes waste as activities that consume resources without creating value for the customer. See Lean Enterprise Institute: Muda.

## QUESTION NO: 11

Which element of waste best describes "the cost of an idle resource"?

**A.** Waiting

**B.** Motion

**C.** Inventory

**D.** Correction

## ANSWER: A

**Explanation:**

Waiting is the Lean waste that best describes the cost of an idle resource. In Lean Six Sigma, a resource may be a person, machine, material, information item, or workpiece. When that resource is unable to proceed because it is awaiting an approval, instruction, upstream output, equipment availability, information, or the next processing step, its available capacity produces no customer value. The resulting lost time, delayed flow, reduced throughput, and often increased lead time are the economic effects captured by waiting waste.

This concept applies both to operators standing by for a machine cycle or materials and to equipment sitting unused while it awaits an operator, setup, maintenance, or incoming work. Identifying waiting helps Green Belts focus improvement on flow: balancing workloads, reducing handoffs and queues, improving equipment reliability, standardizing information, and removing process constraints. These changes allow resources to contribute productively and enable work to move through the value stream with less delay. The American Society for Quality's overview of the seven Lean wastes includes waiting as a core waste category, and Lean Enterprise Institute's Lean overview emphasizes improving flow by removing interruptions and delays.

## QUESTION NO: 12

Examples of a Visual Factory include which of these? (Note: There are 2 correct answers).

**A.** White outlines on floor for proper inventory placement

**B.** Documented procedures with a numerical outline

**C.** Bad/Good indications of gauge readings with red and green outlines

**D.** Implementing a defect inspection device

## ANSWER: A C

**Explanation:**

A Visual Factory, also called visual management or a visual workplace, makes the normal condition of work immediately apparent without requiring someone to consult reports, ask another person, or interpret extensive written instructions. “White outlines on floor for proper inventory placement” is a classic visual-control application: marked locations communicate where materials belong, support orderly flow, and make missing, excess, or misplaced inventory readily visible. This practice is closely associated with workplace organization and the Set in Order element of 5S.

“Bad/Good indications of gauge readings with red and green outlines” is also a visual control because the color coding provides an at-a-glance signal of whether a measurement is within the desired operating condition. A team member can recognize status quickly and respond appropriately, which supports process control, standard work, and faster problem identification. Effective visual management conveys standards and operational status at the point where work occurs. The Lean Enterprise Institute describes visual management as making conditions and information understandable at a glance: Lean Lexicon: Visual Management. These examples also align with Lean tools covered in the IASSC Green Belt body of knowledge: IASSC Green Belt Body of Knowledge.

## QUESTION NO: 13

A Control Plan should include which of these elements for a critical process characteristic? (Note: There are 4 correct answers).

**A.** The characteristic or process parameter to be controlled

**B.** The measurement or monitoring method

**C.** The sampling frequency or review frequency

**D.** A reaction plan for abnormal conditions

**E.** A list of all project team meeting dates

**F.** The original unverified root-cause brainstorm list

## ANSWER: A B C D

**Explanation:**

**The characteristic or process parameter to be controlled** is correct because the plan must clearly identify what is important to monitor. **The measurement or monitoring method** is correct because personnel need to know how the condition will be assessed. **The sampling frequency or review frequency** is correct because the control must define when and how often monitoring occurs. **A reaction plan** is correct because the plan must specify the actions to take when an out-of-control condition, nonconformance, or other abnormality is found.

A Control Plan is used in the Control phase to transfer ownership of the improved process to operational personnel and to sustain the project gains. It commonly also identifies targets or specifications, responsible owners, records, and escalation requirements. It does not replace the project charter or eliminate the need to investigate special-cause variation. See ASQ: DMAIC.

## QUESTION NO: 14

To draw inferences about a sample population being studied by modeling patterns of data in a way that accounts for randomness and uncertainty in the observations is known as ____________________.

**A.** Influential Analysis

**B.** Inferential Statistics

**C.** Physical Modeling

**D.** Sequential Inference

## ANSWER: B

**Explanation:**

Inferential Statistics is correct because it is the branch of statistics used to draw conclusions about a broader population from information observed in a sample. It explicitly accounts for the fact that sample results vary because of random sampling and other sources of variation. In Lean Six Sigma work, teams usually cannot measure every unit, transaction, or customer in the full population. Instead, they collect a representative sample and apply inferential methods to estimate population parameters, test hypotheses, quantify uncertainty with confidence intervals, and determine whether an observed process difference is likely to be meaningful rather than random variation.

This concept is especially important during the Analyze phase of DMAIC, where Green Belts use data to validate suspected root causes and evaluate relationships between inputs and outputs. For example, a team may use a hypothesis test to infer whether a process change affected average cycle time for the overall process, based on sample data. The U.S. National Institute of Standards and Technology describes statistical inference as drawing conclusions about a population from a sample, while accounting for uncertainty. See the NIST Engineering Statistics Handbook: Statistical Inference and the Encyclopaedia Britannica overview of statistical inference.

## QUESTION NO: 15

Which statement(s) are correct for the Regression Analysis shown here? (Note: There are 2 correct answers).

**Regression Analysis: HeatFlux versus %Cu, Thickness**

```
The Regression Equation is
HeatFlux = 484 + 4.80 %Cu - 24.2 Thickness

Predictor      Coef   SE Coef       T      P
Constant     483.67     39.57   12.22  0.000
%Cu          4.7963    0.9511    5.04  0.000
Thickness   -24.215     1.941  -12.48  0.000

S = 8.93207   R-Sq = 85.9%   R-Sq(adj) = 84.8%
Analysis of Variance
Source          DF       SS      MS      F      P
Regression       2  12607.6  6303.8  79.01  0.000
Residual Error  26   2074.3    79.8
Total           28  14681.9

Source     DF   Seq SS
%Cu         1    184.5
Thickness   1  12423.1

Unusual Observations
Obs   %Cu  HeatFlux     Fit  SE Fit  Residual  St Resid
  1  40.6    271.80  274.74    5.08     -2.94    -0.40 X
 22  36.3    254.50  230.91    2.39     23.59     2.74R

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large influence.
```

**A.** This Regression is an example of a Multiple Linear Regression.

**B.** This Regression is an example of Cubic Regression.

**C.** %Cu explains the majority of the process variance in heat flux.

**D.** Thickness explains over 80% of the process variance in heat flux.

**E.** The number of Residuals in this Regression Analysis is 26.

## ANSWER: A D

**Explanation:**

This Regression is an example of a Multiple Linear Regression because the fitted model uses two predictor variables, Thickness and %Cu, to model the response variable, heat flux. A multiple linear regression has one continuous response and two or more predictors; “linear” describes linearity in the estimated coefficients, not necessarily a simple one-predictor relationship. The model output shown therefore represents a single regression equation containing separate terms for Thickness and %Cu.

Thickness explains over 80% of the process variance in heat flux because the regression output attributes more than 80% of the variation in heat flux to Thickness. In regression output, this is assessed through the reported explained variation, such as an R-squared value or the relevant sum-of-squares contribution for the predictor. This indicates that Thickness is the dominant useful explanatory factor in the displayed model and accounts for a substantial portion of the observed heat-flux variation. In Six Sigma analysis, this finding supports prioritizing Thickness as a key input variable for understanding and improving heat-flux performance. See the Minitab overview of multiple regression and the NIST discussion of regression and explained variation.

## QUESTION NO: 16

A Belt experienced an Alpha of .05 and a Beta of .10 and knew these are the most common risk levels when running a Statistical test.

**A.** True

**B.** False

## ANSWER: A

**Explanation:**

**True** is correct. In hypothesis testing, alpha is the probability of a Type I error: concluding that a statistically significant effect exists when the null hypothesis is actually true. A significance level of 0.05 is the widely used conventional threshold for managing this risk. Beta is the probability of a Type II error: failing to detect a real effect. A beta risk of 0.10 corresponds to statistical power of 0.90, because power equals 1 minus beta. Thus, this setting plans a test with a 5% chance of a false positive and a 10% chance of missing a meaningful effect when it is present. These values are commonly used planning conventions in Lean Six Sigma and other quality-improvement applications, especially where stronger detection capability is desired. Before collecting data, a Belt should establish alpha, beta or power, the practical effect size, and process variation, since these inputs determine the sample size needed to make the statistical test suitably reliable. NIST describes alpha and beta as the risks associated with Type I and Type II errors and explains their role in hypothesis testing: NIST Engineering Statistics Handbook. See also NIST's discussion of power and sample-size considerations: NIST sample-size guidance.