



The Lean Six Sigma Orange Belt Examination

Rationale

1 U30242 - Project Management

D

Understand and review project boundaries of the project (scope). Understand the objectives and measurable targets for the project based on the problem statement and scope (goal).

- a) Incorrect. Kanon analysis is used to help the team understand and prioritize customer requirements.
- b) Incorrect. Stakeholder analysis is used to analyze the people who will be impacted by the project.
- c) Incorrect. A Gantt Chart is used to plan and record the steps needed to complete the project.
- d) Correct. The Project Charter is used to help the team understand what it is supposed to accomplish and identify areas that require discussion. Ref 3.4.2

2 U60222 - Level III – Creating Stable and Efficient Processes

B

Understand Lean performance metrics e.g. Takt Time, Cycle Time, Lead Time, queue time, Work in Process (WIP), yield and Overall Equipment Effectiveness (OEE).

- a) Incorrect. Takt Time is the rhythm at which products are requested by the customer (or market). It is defined by the customer, and not by a process or by a planning department.
- b) Correct. It is a measure used in Total Productive Maintenance (TPM) programs. It is also commonly used as a Key Performance Indicator (KPI) in conjunction with Lean Manufacturing programs. The OEE measure is the mathematical product of three elements: Availability, Performance and Quality. Ref 6.2.2
- c) Incorrect. This is the speed of a process.
- d) Incorrect. This shows what the process can do, the potential of a process to produce products and services within the design specifications.

3 U50221 - Level II – Creating a Continuous Improvement Culture

D

Understand the purpose and use of data visualization, analysis and communication.

- a) Incorrect: This is about the Kaizen principle. Better to be 80% right today than 100% right in six months. Ref: 5.1.4
- b) Incorrect: This is the purpose of the 'Root Cause Analysis' (RCA) method of problem solving. Ref 5.1.3
- c) Incorrect: This is the purpose of brainstorming. Ref 5.3
- d) Correct: Visualization of data has two key purposes. The first is to help us in graphical data analysis to develop hypotheses regarding trends, groups and correlations within the data. These hypotheses can then lead to further data collection and testing with a view to drawing a statistically valid conclusion. The second use of visualization of data is then used to communicate findings and conclusions to others. Ref: 5.2.1

4 U60321 - Level III – Creating Stable and Efficient Processes

D

Apply Little's Law.

- a) Incorrect. See Rationale D.
- b) Incorrect. See Rationale D.
- c) Incorrect. See Rationale D.
- d) Correct. 360 units over 5-days is 72 units per person (360/5). 50% increase in units requires a 50% increase in people. Therefore, an additional 2.5 members of staff are required to maintain the current throughput. Ref 6.2.1

5 U20212 - Process Improvement Deployment

B

Understand the difference between Top-Down and Bottom-Up approach. Understand the power of the Bottom-Up approach.

- a) Incorrect. The Bottom-Up approach implies that the team is formed by work-floor staff. The team is encouraged and empowered to develop the steps necessary and to make their own choices of techniques and ways to achieve the expected results.
- b) Correct. The expression Top-Down means that all directions are provided from top management and that execution is done by senior staff. Ref 2.1.2
- c) Incorrect. This is not a change approach. See Rationale B.
- d) Incorrect. Collaborative is a form of the Bottom-up approach. See Rationale B.

6 U50313 - Level II – Creating a Continuous Improvement Culture

A

Apply Root Cause Analysis (RCA) and understand the issues involved in identifying a root cause.

- a) Correct. The root cause is the deepest underlying reason for the cause to originate. If the project team had sought input from a reliability engineer, a list of key design criteria for new equipment would have prevented the seal from being installed. Ref 5.1.3
- b) Incorrect. Had reliability input been sought, the seal would not have been approved, regardless of cost.
- c) Incorrect. Had reliability input been sought, the seal would not have been approved.
- d) Incorrect. See Rationale A.

7 U70142 - Level IV – Creating Capable Processes

B

Understand Poisson and Binomial distributions.

- a) Incorrect. A discrete frequency distribution that gives the probability of a number of independent events occurring in a fixed time. Ref 7.4.2
- b) Correct. In probability theory and statistics, the binomial distribution with parameters n and p is the discrete probability distribution of the number of successes in a sequence of n independent yes/no experiments, each of which yields success with equal probability. Ref 7.4.2
- c) Incorrect. See Rationale B.
- d) Incorrect. See Rationale B.

8 U70212 - Level IV – Creating Capable Processes

C

Understand that Voice of the Customer (VOC) requirements need to be translated into Critical To Quality (CTQ) targets and specifications.

- a) Incorrect. CTQ's are not ranked or prioritized.
- b) Incorrect. CTQ's should be verified and controlled.
- c) Correct. CTQ's should be defined and measurable. Ref 7.1.2
- d) Incorrect. This does not describe a measure of a customer requirement or CTQ.

9 U30341 - Project Management

A

Prepare problem statements in relation to customer requirements.

- a) Correct. A problem statement should be documented, ensuring the problem is SMART. It should be a specific statement of the problem and goal. Ref 3.4.1
- b) Incorrect. The problem description should never mention a solution to a problem. If a solution is known a problem-solving project is not needed.
- c) Incorrect. A problem should be specifically and quantitatively defined, before blindly going down the path of fixing the wrong problem, or not fixing anything at all. See Rationale A.
- d) Incorrect. See Rationale A.

10 U60211 - Level III – Creating Stable and Efficient Processes

B

Participate in process mapping initiatives to visualize the flow of activities and decisions within a process.

- a) Incorrect. This is a reason to use a swim-lane or deployment Flowchart not a transportation / Spaghetti (workflow) diagram.
- b) Correct. A transportation / Spaghetti (workflow) diagram is used to improve the physical layout of a workspace. Ref 6.1.1/6.1.2
- c) Incorrect. This is a reason to use a SIPOC diagram, not a transportation / Spaghetti (workflow) diagram.
- d) Incorrect. This is a reason to use a Value Stream Map (VSM), not a transportation / Spaghetti (workflow) diagram.

11 U10231 - World Class Performance

D

Understand the value of Lean and Six Sigma, its philosophy and goals. Understand the relationship between Lean and Six Sigma.

- a) Incorrect. Both share this principle.
- b) Incorrect. Both share this requirement.
- c) Incorrect. Both share this principle.
- d) Correct. Both Lean and Six Sigma have a strong foundation of improving customer value. Both seek to achieve improved effectiveness and process quality by reducing variation. Both require the commitment of staff and management. Neither refers to a long learning curve. Ref 1.3.1.

12 U70252 - Level IV – Creating Capable Processes

D

Understand the basic principles of performing a Measurement System Analysis. Understand the difference between Repeatability and Reproducibility (R&R) and the meaning of the number of distinct categories.

- a) Incorrect. (4) The amount of variation caused by the measurement procedure or operator is a factor of influence on the accuracy of the instrument.
- b) Incorrect. (3) The amount of variation caused by the operators of the measuring instrument is a factor of influence on the measuring system.
- c) Incorrect. (2) Adjustments and rectifying variations in instruments used to measure will improve confidence in results.
- d) Correct. (1) A process that is stable shows only common cause (known) variation. This is not a reflection of a good measuring system. It is a measure of a controlled process. Ref 7.5.2

13 U50331 - Level II – Creating a Continuous Improvement Culture

D

Apply brainstorm techniques: Affinity Diagram, 5-Why's and Ishikawa.

- a) Incorrect. (4) See Rationale B.
- b) Incorrect. (3) The second phase of summarizing involves sharing, capturing and grouping ideas, and simultaneously encourages the synergetic process that produces innovative spin off ideas.
- c) Incorrect. (2) A two-phased approach starts with individuals noting their own ideas silently, without influence from others.
- d) Correct. (1) Senior members of the team or dominant individuals can lead a team down a single train of thought. It is advisable to start with an open phase, allow individuals to brainstorm individually before sharing and capturing ideas. Ref 5.3.1

14 U70271 - Level IV – Creating Capable Processes

C

Interpret the correlation coefficient.

- a) Incorrect. The 'Response' is the dependent variable Y that changes as a result of a changing 'Factor'. The 'Factor' is the independent variable X, also called the Predictor variable.
- b) Incorrect. The value is 0.20, a positive value. A positive value (between 0 and 1) indicates that as one value increases the other increases as well.
- c) Correct. A positive value of 0.20 indicates a weak correlation, indicated by a coefficient value of <0.5. It is therefore dependent in that as one value increase, the other follows. Ref 7.7.1 & 7.7.2
- d) Incorrect. A positive value of 0.20 indicates a positive, but weak correlation, indicated by a coefficient value of <0.5. Ref 7.7.1

15 U30232 - Project Management

C

Understand different customers have different needs, expectations, requirements and desires.

- a) Incorrect. These are the Voice of the Customer (external) and are more interested in better, cheaper and faster products and services.
- b) Incorrect. Whilst quality management are the 'Voice of the Business' (internal), the Operational staff are more likely to be concerned with working conditions and operating hours.
- c) Correct. Their desire is mostly about a safe work environment, employee satisfaction, new business opportunities and cost reductions. Ref. 3.3.2
- d) Incorrect. These are the Voice of the Customer (external) and are more interested in better, cheaper and faster products and services.

16 U70261 - Level IV – Creating Capable Processes

C

Understand the basic principles of hypothesis testing.

- a) Incorrect. This is not an error, accepting a statement to be true when it is actually true.
- b) Incorrect. This is the principle of statistical Hypotheses. Hypothesis testing refers to the formal procedures used by statisticians to accept or reject statistical hypotheses.
- c) Correct. This is an Alpha risk. Rejecting the innocent plea when it is true. Supporting the alternate hypothesis when the null hypothesis is true. Ref 7.6.1
- d) Incorrect. This is a Beta risk. Failing to reject an innocent plea when it is false. Not supporting the alternate hypothesis when the alternate hypothesis is true.

17 U10121 - World Class Performance

C

Recall the origins of Total Quality Management (TQM), Lean and Six Sigma.

- a) Incorrect. See Rationale C.
- b) Incorrect. See Rationale C.
- c) Correct. In the 1930's and more intensely after World War II (1950), it occurred to Toyota that a series of simple innovations might make it possible to provide both continuity in process flow as well as a wide variety of product offerings. Ref 1.2.1
- d) Incorrect. See Rationale C.

18 U60232 - Level III – Creating Stable and Efficient Processes

C

Understand that Value Stream Mapping (VSM) is a technique for identifying Waste and Non-Value Added activities.

- a) Incorrect. See Rationale C.
- b) Incorrect. See Rationale C.
- c) Correct. The objective of VSM is to reduce Lead Time and to eliminate Waste. Ref 6.3.2
- d) Incorrect. See Rationale C.

19 U70372 - Level IV – Creating Capable Processes

A

Apply linear regression to understand the relationship between factors and response.

- a) Correct. Regression Analysis investigates the Cause and Effect relationship of a Factor on a Response. Linear Regression generates an equation that describes the linear (statistical) relationship between a continuous dependent variable and one or more independent changing factors. The spread of the entries does not indicate any relationship between the temperature and the number of product sales. Ref 7.2.2
- b) Incorrect. See Rationale A.
- c) Incorrect. See Rationale A.
- d) Incorrect. See Rationale A.

20 U50312 - Level II – Creating a Continuous Improvement Culture

C

Apply elements of Visual Workplace and understand how these can help to control the improved process.

- a) Incorrect. Real time information, clear instructions, visual aids, warning signals, and other critical operations help employees to know what to do, when to do it and how to do it.
- b) Incorrect. 'Poka Yoke' mistake proofing refers to any constraint designed into a process or product to prevent incorrect operation by the user. Ref 5.1.2/6.8.3
- c) Correct. Kanban cards are used to support a pull 'Just in Time' (JIT) behaviour. Allow each sub-process to withdraw from the downstream sub-process only the parts needed in the amount that is needed. Ref 5.1.2/6.6.1
- d) Incorrect. 'Poka Yoke' mistake proofing refers to any constraint designed into a process or product to prevent incorrect operation by the user. Ref 5.1.2/6.8.3

21 U60252 - Level III – Creating Stable and Efficient Processes

A

Understand the meaning of Work Balancing.

- a) Correct. The buildup of a queue of people is an indicator that capacity cannot meet demand, so a constraint is present. Ref 6.5.2
- b) Incorrect. The unnecessary movement of people in the workplace describes motion waste, not the presence of a constraint.
- c) Incorrect. Items that have been 'red tagged' have been marked for potential removal as they are not used.
- d) Incorrect. A preventive maintenance schedule indicates a programme of works to prevent machine breakdowns and failures.

22 U30211 - Project Management

A

Understand the Lean Six Sigma levels of expertise: Master Black Belt, Black Belt, Green Belt, Orange Belt and Yellow Belt. Understand various team roles and responsibilities: Deployment leader, Champion, Project leader, Coach and Team member.

- a) Correct. Lean Six Sigma Black Belts are experts in executing Lean Six Sigma projects. The scope of the projects can be across departments and organizations. Ref 3.1.1
- b) Incorrect. Lean Six Sigma Green Belts may work alone or as a junior project manager in a team. The scope of the project is often within one department, process or expertise rather than across departments.
- c) Incorrect. Lean Six Sigma Orange belts are often team leaders or supervisors with an in-depth knowledge of a process, product or equipment. Therefore they will also be valuable team members in Green or Black Belt projects.
- d) Incorrect. Lean Six Sigma Yellow Belts are experienced with the processes in daily practice and are therefore the ideal leaders of Kaizen projects or valuable team members in Green or Black Belt projects.

23 U60341 - Level III – Creating Stable and Efficient Processes

C

Identify and eliminate the 8 types of Operational Waste (Muda); Overproduction, Waiting, Transport, Over processing, Inventory, Movement, Defects and Unused expertise.

- a) Incorrect. See Rationale C.
- b) Incorrect. See Rationale C.
- c) Correct. Several boxes of unused supplies or stock represent 'Inventory' Waste. Searching and unnecessary movements represent 'Movement' Waste. Ref 6.4.1
- d) Incorrect. See Rationale C.

24 U10111 - World Class Performance

A

Recall that Operational Excellence can be applied to processes in different types of enterprises.

- a) Correct. Continuous improvement methods like Lean and Six Sigma support organizations to become successful in Operational Excellence. Although Lean Six Sigma finds its origin in manufacturing, it is often applied within service organizations as well. Ref 1.1.1/1.1.2
- b) Incorrect. See Rationale A.
- c) Incorrect. See Rationale A.
- d) Incorrect. See Rationale A.

25 U70251 - Level IV – Creating Capable Processes

A

Understand the different measurement methods for continuous and discrete data.

- a) Correct. A Go/No go Gage refers to an inspection tool to check a part of assembly against a certain dimension or tolerance specification. The Gage has two possible outcomes: OK (pass) or Not OK (fail). The check is not open to interpretation. Ref 7.5.1
- b) Incorrect. See Rationale A.
- c) Incorrect. See Rationale A.
- d) Incorrect. See Rationale A.

26 U60253 - Level III – Creating Stable and Efficient Processes

C

Understand the eight pillars of Total Product Maintenance (TPM) and understand how it can be used for process improvement.

- a) Incorrect. See Rationale D.
- b) Incorrect. See Rationale D.
- c) Correct. TPM focuses on the effective and efficient use of equipment, by avoiding breakdowns, delays and machine-related rejections. Ref 6.5.3
- d) Incorrect. This is a reactive solution, to deal with problems when they arise. Improving availability requires fewer breakdowns, delays and machine-related rejections.

27 U70291 - Level IV – Creating Capable Processes

B

Understand the limitations of One-Factor-At-a-Time (OFAT) experiments and that there are more efficient ways of experimenting.

- a) Incorrect. (4). See Rationale D.
- b) Correct. (3). This is the traditional One-Factor-At-a-Time (OFAT) approach. Ref. 7.9.1
- c) Incorrect. (2). See Rationale D.
- d) Incorrect. (1). DOE is a systematic and highly effective way to conduct experiments, to examine the influence of factors and factor interactions on the responses. Ref. 7.9.1

28 U40231 - Level I – Creating a Solid Foundation

C

Understand quality procedures, the need to be disciplined and to work according to procedures.

- a) Incorrect. See Rationale D.
- b) Incorrect. This is not a type of quality activity.
- c) Correct. Quality control is about inspections and approvals that are applied to finished products to ensure only good products will be delivered to the customer. Ref. 4.3.1
- d) Incorrect. Quality assurance is about the preparations and inline control measures applied to assure only products that meet customer expectations will be produced. It is also about preventing mistakes or defects rather than defect identification.

29 U70222 - Level IV – Creating Capable Processes

B

Understand it is important to follow systematic data collection.

- a) Incorrect. The total collection of objects is called the 'population' under study. Generally is not is not realistic to measure all objects of a population, a 'sample' of the population can be used.
- b) Correct. Systematic sampling requires the elements of a population to be listed. The first sample is randomly chosen from the first k-1 elements and then every k-th element in the list is chosen (systematically). Ref SGM/7.2.2
- c) Incorrect. This is stratified sampling. The population is divided into non-overlapping subgroups, or strata, and the elements are randomly selected proportionally from the different strata.
- d) Incorrect. This is simple random sampling. A subset (sample) of elements chosen from a larger set (population).

30 U60271 - Level III – Creating Stable and Efficient Processes

B

Understand the difference between Current State and Future State Value Stream Mapping.

- a) Incorrect. See Rationale C.
- b) Correct. The resultant Future State Map will be the optimal logistical flow that can be used for the next 1-3 years. Ref 6.7.1
- c) Incorrect. The intention of drawing a Value Stream Map is to identify Waste, problems and improvements opportunities, not to change the output. Ref 6.7.1
- d) Incorrect. Value Stream Mapping also includes material flows, information processes and business processes.

31 U30252 - Project Management

C

Understand the importance of presenting project progress and results.

- a) Incorrect. See Rationale C.
- b) Incorrect. See Rationale C.
- c) Correct. A Tollgate review session is regularly scheduled between each phase to present the progress to the Champion. During this meeting all results within a certain phase are presented. In the end of the meeting the Champion confirms that the team has successfully completed the phase and may 'pass the Tollgate'. Ref 3.5.1
- d) Incorrect. See Rationale C.

32 U70282 - Level IV – Creating Capable Processes

D

Interpret Cp and Cpk to assess process capability.

- a) Incorrect. See Rationale D.
- b) Incorrect. See Rationale D.
- c) Incorrect. See Rationale D.
- d) Correct. The relationship between specification width, sigma level, defect rate and process capability, when the process is perfectly centred, shows that a Capability Index of 1.00 provides for 0.27% defective. Therefore the remaining 99.73% of units produced fit within the tolerance range. Ref 7.8.2

33 U50314 - Level II – Creating a Continuous Improvement Culture

B

Set up and lead Kaizen events.

- a) Incorrect. A typical Kaizen Blitz takes a few days to a week to carry out and is led by a facilitator. It is about getting things done immediately, not about making weeks of analysis and then taking a few more weeks to implement the solution.
- b) Correct. The customer should always be the starting point of improvement projects. This not only concerns the external customer, but also the internal customer. Each step in the process has a customer who receives the outcome of its process steps. Therefore it is important that each process step is treated like a customer. Ref. 5.1 4
- c) Incorrect. See Rationales A and B.
- d) Incorrect. See Rationales A and B.

34 U70241 - Level IV – Creating Capable Processes

D

Understand and interpret Normal distribution.

- a) Incorrect. About 68.3% of the data within the population is within $\mu + 1\sigma$. 1.25 on the curve is -1σ .
- b) Incorrect. The mean of a Standard Normal Distribution is 0, which is the centre of the bell curve. The mean is 1.4 on the bell curve.
- c) Incorrect. About 68.3% of the data within the population is within $\mu + 1\sigma$. 1.55 on the curve is 1σ .
- d) Correct. About 99.7% of the data within the population is within $\mu + 3\sigma$. 1.85 on the curve is 3σ . Ref. 7.4.1

35 U30223 - Project Management

A

Understand and follow the Process Improvement 'Define, Measure, Analyze, Improve and Control' (DMAIC) roadmap.

- a) Correct. The purpose of the Control-phase is to sustain the achieved results. Improvements should be monitored to ensure sustainable success. Ref 3.2.3
- b) Incorrect. Lessons from other projects should be sought as early as possible, during the Define-phase.
- c) Incorrect. Improvements are defined, implemented and verified during the Improve-phase.
- d) Incorrect. A Value Stream Map (VSM) of the future state will be composed during the Improve-phase within a Lean project.

36 U60262 - Level III – Creating Stable and Efficient Processes

B

Understand the basic principles of Volume leveling, Type leveling and One-Piece-Flow. a)

- a) Incorrect. Delivery Time is the time for products or services to be transported from supplier to customer. Reducing Delivery Time does not increase the rate of production to meet demand. Ref 6.6.2
- b) Correct. Reducing the Cycle Time is takes to complete the steps in a process will increase the rate of production to meet demand. Ref 6.6.2
- c) Incorrect. Queue Time is the waiting time between two process steps. Reducing Queue Time does not increase the rate of production to meet demand. Ref 6.2.2
- d) Incorrect. Takt Time is the rhythm of customer orders. It is not practical to take fewer orders rather than increase the rate of production. Ref 6.2.2

37 U70232 - Level IV – Creating Capable Processes

C

Understand the difference between special cause and common cause variation.

- a) Incorrect. See Rationale A and B.
- b) Incorrect. Common cause variation is a measure of the process potential or process technology. Common cause variation (Stable, Predictable or In-Control) is the remaining variation after removing instabilities and special cause variation. If a process shows only natural variation it is in a state of statistical control.
- c) Correct. In some cases, special cause variation can demonstrate extreme behaviour. Measurements that are clearly outside the natural behaviour of the process, caused by a specific factor such as environmental conditions or process input parameters. Special cause variation is also called exceptional or assignable variation. Ref 7.3.2
- d) Incorrect. See Rationale A and B.

38 U70281 - Level IV – Creating Capable Processes

B

Understand basic principles of process capability studies. Understand the importance of stability in process capability studies.

- a) Incorrect. Process capability is the potential of a process to produce products or services within the design specification. These design specifications are called the 'Lower Specification Limit' and 'Upper Specification Limit'.
- b) Correct. Process capability assumes only common cause variation and not special cause variation. Ref 7.8.1
- c) Incorrect. Once a process is brought into statistical control its performance is predictable, and its capability to meet customer expectations can be assessed.
- d) Incorrect. Process capability is the potential of a process to produce products or services within the design specifications. Process capability represents the best performance of the process itself. This is demonstrated when the process is operated in a state of statistical control. Ref 7.8.1

39 U30212 - Project Management

D

Understand the basic principles of team formation and team member selection.

- a) Incorrect. Team members are usually subject matter experts in the part of the process they undertake every day.
- b) Incorrect. It is the Green Belt team leader, not the team member who must have some knowledge of statistical analysis.
- c) Incorrect. Team members are rarely full time on team projects.
- d) Correct. Teamwork means that people will cooperate, using their individual skills and providing constructive feedback, despite any conflict between individuals. Team members need to be able to listen to other people both in the team meetings and outside in the workplace. Ref 3.1.2

40 U50322 - Level II – Creating a Continuous Improvement Culture

D

Apply basic quality tools: Check sheet, Pareto chart, Scatter Plot, Bar chart, Pie chart, Time Series Plot, Histogram and Box Plot.

- a) Incorrect. See Rationale D.
- b) Incorrect. See Rationale D.
- c) Incorrect. See Rationale D.
- d) Correct. The trend shows that as you grow older you need less sleep. The scatter plot shows that a 6 year old needs 12 hours; this reduces to just 7 hours by the age of 18 years. Ref. 5.2.2

41 U40311 - Level I – Creating a Solid Foundation

D

Organize the work environment by applying 5S (Sort, Straighten, Shine, Standardize, Sustain). Understand that an organized environment will improve safety and moral.

- a) Incorrect. Standardize: Procedures and standards are visible. See Rationale D.
- b) Incorrect. Shine: Everything is constantly kept clean. See Rationale D.
- c) Incorrect. Sustain: Procedures are followed with discipline. See Rationale D.
- d) Correct. After the clearing out process in the first step (Sort), the second step is to straighten. The objective of this step is to identify a permanent location for each item. It should be clear for everyone where to find an item and where to put it back in place after use. Ref 4.1.1

42 U70201 - Level IV – Creating Capable Processes

B

Understand the objectives and benefits of Statistical Process Control (SPC).

- a) Incorrect. See Rationale B.
- b) Correct. The concept of statistical process control uses simple control charts for early indication of process variation. SPC is an important control tool in the Control phase, at the end of an improvement project, to assure that results will be sustained. Ref 7.10.1
- c) Incorrect. See Rationale B.
- d) Incorrect. See Rationale B.

43 U60261 - Level III – Creating Stable and Efficient Processes

C

Understand the meaning of Pull.

- a) Incorrect. (4) To avoid Waste, it is necessary to work according to the Just In Time (JIT) principle. This starts with the demand of the customer.
- b) Incorrect. (3) This is a symptom of overproduction which Pull production seeks to eliminate.
- c) Correct. (2) This is a symptom of overproduction which Pull production seeks to eliminate. Ref 6.6.1
- d) Incorrect. (1) To avoid Waste, it is necessary to work according to the JIT principle. This starts with the demand of the customer.

44 U50232 - Level II – Creating a Continuous Improvement Culture

B

Participate in decision making techniques e.g. Cause & Effect Matrix.

- a) Incorrect. The importance of each output is rated on a scale of 1-10.
- b) Correct. The specifications of the outputs or requirements are taken from the Critical to Quality (CTQ) measures – the target and the upper and lower tolerances. Ref 5.3.2
- c) Incorrect. These are the Key Process Input Variables. These are ‘causes’, the things that if changed will affect the outcome.
- d) Incorrect. See Rationale B.

45 U60363 - Level III – Creating Stable and Efficient Processes

A

Reduce change over times by implementing Single Minute Exchange of Die (SMED).

- a) Correct. An important element to reduce the changeover time is to move activities as much as possible outside the time of the actual changeover (when the production process is stopped). External activities like preparation and cleaning can be done while the machine is running. Ref 6.6.3
- b) Incorrect. See Rationale A.
- c) Incorrect. See Rationale A.
- d) Incorrect. See Rationale A.

46 U70221 - Level IV – Creating Capable Processes

D

Understand the Six Sigma process performance metrics e.g. parts per million (ppm), defects per million opportunities (DPMO), defects per unit (DPU) and rolled throughput yield (RTY). Understand the difference between a defect and a defective.

- a) Incorrect. (4) The Process Capability index has become the standard metric for defining what a process can do. Ref 7.2.1
- b) Incorrect. (3) The abbreviation DPMO stands for Defects per Million Opportunities or nonconformities per million opportunities. Ref 7.2.1
- c) Incorrect. (2) The 'Rolled Throughput Yield' is defined as the probability that a unit will pass a number of sequential process steps without any defect. The main difference between RTY and normal process yield is that products that are not 100% OK, but could be reworked or corrected, are now considered incorrect in the RTY-calculation, because the products were not 'Right the First Time. Ref 7.2.1
- d) Correct. (1) This is not a Six Sigma metric. Ref 7.2.1

47 U20211 - Process Improvement Deployment

A

Understand that an organization's culture can influence the success of Lean Six Sigma deployment.

- a) Correct. This affects the collective way of thinking and working by people in the organization and determines the standards and values of an organization. A major reason why a process of change is difficult is because the organizational culture, and the structure in which it is embedded, often reflect the imprint of earlier periods in a persistent way. Ref 2.1.1
- b) Incorrect. See Rationale A.
- c) Incorrect. See Rationale A.
- d) Incorrect. See Rationale A.

48 U30222 - Project Management

D

Understand and be familiar with the 'Eight Disciplines (8D) Problem solving method' which is used to approach and resolve problems.

- a) Incorrect. See Rationale D.
- b) Incorrect. See Rationale D.
- c) Incorrect. See Rationale D.
- d) Correct. It is also a communication technique. A customer can ask a supplier to conduct an 8D investigation when faced with a problem. Because the steps in the process are defined, it is clear to the supplier what is expected. During the problem solving method, the customer and supplier can communicate about expectations and progress with certain steps. Ref 3.2.2

49 U60281 - Level III – Creating Stable and Efficient Processes

B

Understand the purpose and elements of Process Failure Modes and Effects Analysis (FMEA), including the Risk Priority Number (RPN) and describe FMEA results for processes.

- a) Incorrect. Responsibility should be assigned for each action, but the RPN does not indicate the level of authority required to do this.
- b) Correct. The RPN is calculated as the product of three quantitative ratings, which are related to the effects, causes and controls. Base on the highest RPN scores, the team will start to determine actions plans to decrease the RPNs. Ref 6.8.1
- c) Incorrect. Cost of risk mitigation actions are not entered on the FMEA worksheet.
- d) Incorrect. This is the purpose of 'Assigning Responsibility' and a 'Target Completion Date' in the worksheet.

50 U40221 - Level I – Creating a Solid Foundation

B

Understand that standardized tasks are the foundation for continuous improvement. Interpret Standard Operating Procedures (SOPs) and one-point-lessons.

- a) Incorrect. Quality Strategy is part of a Quality Management System (QMS). SOPs also form part of this. See Rationale B.
- b) Correct. The SOP describes what items and tools are required, the sequence of the process activities. It also clearly describes what the final product should look like and the quality checks need to be performed on the product. It mentions the Cycle Time for the process step, which means that it is defined how long the employee is expected to work at the operation step. Ref 4.2.1
- c) Incorrect. The SOP is more than a work instruction document. See Rationale B.
- d) Incorrect. See Rationale B.

Lean Six Sigma Orange Belt Examination
Mock Exam V1.1