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**THE  
LSS PRIMER  
SOLUTIONS TEXT**

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## SECTION II

### LEAN SIX SIGMA GOALS - SAMPLE QUESTIONS

- 2.1. Lean and six sigma share in common all of the following issues, EXCEPT:
- They both focus on continuous improvement
  - They both require top management commitment
  - They both focus on customer satisfaction
  - They both require long learning curves

Solution: Note that a negative response is requested. Lean and six sigma are not opposite or mutually exclusive. Answers **a** and **c** are reasons why lean and six sigma so naturally became a powerful hybrid approach for continuous improvement. Both approaches, separately or combined, require management commitment. Many of the lean tools have short learning curves.

**Answer d is the correct, incorrect, choice.**

Reference: *LSS Primer*, Section II - 2/3.

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- 2.2. The most important element in lean six sigma deployment would be considered:
- Training
  - Organizational structure
  - Management support
  - Reward and recognition

Solution: All of the answer choices are key lean six sigma elements. However, the question states the "most important element." Management support is the most important element listed. Training, structure, and rewards can all be provided and/or adjusted if management support is present.

**Answer c is correct.**

Reference: *LSS Primer*, Section II - 39 (and logic).

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- 2.3. Which of the following concepts is mostly associated with Taiichi Ohno?
- SPC
  - TOC
  - CTQ
  - TPS

Solution: Taiichi Ohno is the main contributor to the Toyota Production System (TPS).

**Answer d is correct.**

Reference: *LSS Primer*, Section II - 17/18.

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- 2.4. Which of the following is the LEAST acceptable reason for the deployment of lean six sigma projects?
- A focus on cost savings
  - A focus on customer satisfaction
  - A focus on internal problems
  - A focus on design improvements

Solution: It should be recognized that different organizations may have different priorities at different times. Harry states that answers **a**, **b**, and **c** are all valid. There are other ways to manage design improvements.

**Answer d is the correct, incorrect, choice.**

References: *LSS Primer*, Section II - 2/6 (and logic). Harry, M. & Schroeder, R. (2000). *Six Sigma*. New York: Currency, Doubleday.

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- 2.5. Lean six sigma project benefits could include all of the following, EXCEPT:
- Increased profits
  - Improved process capability
  - Increased defects
  - Reduced warranty claims

Solution: Note that a negative response is requested. Some project benefits are easily expressed in dollar amounts, for example: increased sales, increased profits, reduced defects, reduced scrap, lowered warranty claims, improved process capability, increased up-time, reduced spare parts inventories, fewer customer cancellations or returned product. Other project benefits are worthwhile, but harder to equate to dollars: improved employee morale, increased skill levels through training, lower employee turnover, increased customer satisfaction, more aesthetically appealing product, organization's reputation enhanced, pride from a job well done, friendships, or political power. Of the four items listed, increased defects would not be considered a project benefit.

**Answer c is the correct, incorrect, choice.**

Reference: *LSS Primer*, Section II - 2/6.

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- 2.6. Kaplan and Norton have outlined a business planning process that gives consideration to factors other than strictly financial ones. It provides a greater perspective for stakeholder interests. This approach is referred to as:
- Balanced scorecard
  - Strategic planning
  - Five forces of competitive strategy
  - Quality function deployment

Solution: The balanced scorecard focuses the planning process on: financial, internal business process, learning and growth, and customer perspectives. The answer, five forces of competitive strategy, is related to Michael Porter's work. Quality function deployment is sometimes referred to as the House of Quality.

**Answer a is correct.**

References: *LSS Primer*, Section II - 45. Kaplan, R.S., & Norton, D.P. (1996, January-February). "Using the Balanced Scorecard as a Strategic Management System." Harvard Business Review.

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### LEAN SIX SIGMA GOALS - SAMPLE QUESTIONS

- 2.7. Increasing performance in a lean six sigma corporation from 3 sigma to 4 sigma would reduce defects per million by a factor of:
- 2
  - 8
  - 10
  - 16

Solution: Since six sigma is referenced in the question, the assumption is that a  $\pm 1.5$  sigma must be included. Using the shift, the 4 sigma defect rate is 6,210 ppm and the 3 sigma defect rate is 66,810 ppm or a ratio of 1:10.76.

**Answer c is correct.**

Reference: *LSS Primer*, Section II - 8.

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- 2.8. In a nutshell, lean six sigma is considered:
- A business improvement approach
  - A focus on critical customer items
  - An elimination of mistakes and defects
  - A concentrated focus on business outputs

Solution: All answers have some validity. The best choice is answer **a**. Answer choices **b**, **c**, and **d** are considered subsets of answer choice **a**.

**Answer a is correct.**

Reference: *LSS Primer*, Section II - 2/11 (and logic).

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- 2.9. What guru is MOST widely associated with DOE?
- Shingo
  - Juran
  - Ishikawa
  - Taguchi

Solution: Certainly design of experiments is (was) not outside of the grasp of any of the four listed luminaries. However, Taguchi presented a cookbook approach for Japanese (and later American) engineers to use in the application of DOE.

**Answer d is correct.**

Reference: *LSS Primer*, Section II - 36/37.

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- 2.10. The term "metrics" most frequently refers to:
- a. A unit of measurement
  - b. The metric system
  - c. The science of weights and measurements
  - d. An evaluation method

Solution: This is a definition question. Answers **a** and **b** refer to a traditional form of measurement such as the metric system and are incorrect. Answer **c** is the definition for metrology. The modern definition of "metrics" is a form of measurement or evaluation (answer **d**).

**Answer d is correct.**

Reference: *LSS Primer*, Section II - 42.

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- 2.11. If one chose to look at any business enterprise on a main level basis, which of the following categories would NOT have either KPIV (key process input variables) or KPOV (key process output variables)?
- a. Process
  - b. Operations
  - c. Business
  - d. Technological

Solution: Note that a negative response is requested. Although the variables themselves may differ, process, operations and business levels have key input and output variables. A technological level is not separately identified. It is integrated into the major three categories.

**Answer d is the correct, incorrect, choice.**

Reference: *LSS Primer*, Section II - 46/47.

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- 2.12. What luminary is generally recognized as being the creator of the control chart?
- a. Deming
  - b. Shewhart
  - c. Harry
  - d. Ishikawa

Solution: The honor belongs to Dr. Walter Shewhart. In fact, some quality professionals still refer to them as Shewhart control charts.

**Answer b is correct**

Reference: *LSS Primer*, Section II - 34.

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- 2.13. The defect levels, as reported by Motorola in their six sigma program, are higher than one might expect from use of a standard normal table or traditional capability calculations. Why is this true?
- Motorola found their processes followed the exponential distribution
  - Motorola allowed for failure on one-tail only
  - Motorola allowed for a 1.5 sigma shift in the mean
  - Motorola found that six sigma efforts increased process variation

Solution: Motorola allowed for a potential process shift or drift of 1.5 standard deviations in order to “safely” report defect levels or process improvements.

**Answer c is correct.**

References: *LSS Primer*, Section II - 7/8.

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- 2.14. A lean enterprise approach encompasses which of the following departments?
- Manufacturing only
  - All company departments plus suppliers
  - Manufacturing, quality, and the supply chain
  - Manufacturing and quality departments

Solution: Lean enterprise encompasses the entire production system, beginning with the customer. Both production and service departments are included. Lean enterprise also includes suppliers.

**Answer b is correct.**

Reference: *LSS Primer*, Section II - 11.

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- 2.15. From an upper management perspective, what has been the principal motivating factor in embracing lean six sigma?
- Bottom line results
  - Market share growth
  - Defect reductions
  - Customer focus

Solution: Philip Crosby once stated that upper management is interested in money, making money, and not losing money. He said there must be something else, but he never got that far in conversations with them. Answers **b**, **c**, and **d** could be considered subsets of answer **a**.

**Answer a is correct.**

Reference: *LSS Primer*, Section II - 10/11 (and logic).

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### LEAN SIX SIGMA GOALS - SAMPLE QUESTIONS

2.16. Strategic goals will be subdivided into:

- a. Major benchmarks
- b. Loss functions
- c. Numerous tactical goals
- d. Appropriate metrics

Solution: The strategic goals must be moved down to the lower levels of the organization via some technique. Major benchmarks (answer **a**) and loss functions, a Taguchi term, (answer **b**) are filler answers. Metrics (answer **d**) or measurements may be applied. However, none of these choices are subdividing or deployment techniques. The strategic goals must be subdivided into numerous tactical goals (answer **c**).

**Answer c is correct.**

Reference: *LSS Primer*, Section II - 44 (and logic).

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2.17. Of the key elements of an organizational plan, which of the following would be most likely to contain numbers and dates?

- a. Vision statements
- b. Tactical objectives
- c. Guiding principles
- d. Mission statements

Solution: Some goals and all tactical objectives contain elements that are quantifiable and measurable.

**Answer b is correct.**

Reference: *LSS Primer*, Section II - 44 (and logic).

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2.18. Who was the first CEO to understand the need to control variation instead of the process average as a way to significantly improve quality?

- a. Jack Welch
- b. Robert Galvin
- c. Henry Ford
- d. Bill Smith

Solution: Robert Galvin was Motorola's CEO when Bill Smith being first developed the concept of +/- 6 sigma quality levels. Many CEOs would have rejected the concept as being too technical. There was a lot of merit in Galvin's decision to give the 6 sigma concept a try.

**Answer b is correct.**

Reference: *LSS Primer*, Section II – 37.

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### LEAN SIX SIGMA GOALS - SAMPLE QUESTIONS

- 2.19. Which of the following would be considered a strategic quality goal?
- a. Commitment to the customer
  - b. Reducing the scrap rate in the finishing department by 1%
  - c. Improved performance inspection checks on work in progress
  - d. Training 6 green belts in statistical techniques this quarter

Solution: Given the four answers to choose from, the idea is to distinguish between the options in some manner. There is one broad scope (strategic) goal and three detailed (tactical) department goals listed. The strategic goal is answer a. The other three answers are more tactical in nature. Strategic quality goals are set by top management, while the tactical quality goals are established at the lower organizational levels.

**Answer a is correct.**

Reference: *LSS Primer*, Section II - 42/44 (and logic).

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- 2.20. The concept most closely associated with lean production is:
- a. Better quality
  - b. Faster production
  - c. Flexible production
  - d. Elimination of waste

Solution: All answer choices have merit. A good lean implementation will result in better quality, and faster and more flexible production. However, the central concept in lean production is the elimination of waste.

**Answer d is correct.**

Reference: *LSS Primer*, Section II - 11.

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- 2.21. Why is lean six sigma called TQM on steroids?
- a. Because of the extensive training element required
  - b. Because of the inclusion of statistical and lean tools
  - c. Because of the heavy impact of top management support
  - d. Because of the impact of cost savings on the bottom line

Solution: The steroid quote comes from the inclusion of statistical items such as DOE, DFSS, statistical analysis, etc. and certain lean manufacturing tools.

**Answer b is correct.**

Reference: *LSS Primer*, Section II - 9/11 (and logic).

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2.22. Strategic goals must be subdivided. Thus, they are:

- a. Delegated
- b. Distributed
- c. Accountable
- d. Deployed

Solution: The key question word is "subdivided." Delegated means to be assigned goals (answer **a**). Distributed means to be given goals (answer **b**). Accountable means to be responsible for the goals (answer **c**). Deployed means to have the goals spread out into attainable portions. Answer **d** is the best choice.

**Answer d is correct.**

Reference: *LSS Primer*, Section II - 44 (and logic).

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2.23. Many tools can be used in either lean or six sigma projects. A problem solving approach that unifies project follow-up is:

- a. SIPOC
- b. DOE
- c. DMAIC
- d. TPM

Solution: Some experts argue the grandfather of problem solving approaches PDCA (plan, do, check, act) is the default choice for lean projects. DMAIC (define, measure, analyze, improve, control) could be seen as an improved version of PDCA and it has been the favorite of the six sigma crowd for many years. Notice that PDCA is not an answer option and SIPOC, DOE, and TPM are specific techniques for specific purposes. DMAIC has become the preferred problem solving approach for lean six sigma projects.

**Answer c is correct.**

Reference: *LSS Primer*, Section II - 6.

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2.24. Which of the following quality gurus is most closely associated with the term "total quality management?"

- a. Crosby
- b. Feigenbaum
- c. Deming
- d. Juran

Solution: In the USA, Feigenbaum is generally given credit for the term total quality control (including total quality management). None of the other answer choices were against the concept.

**Answer b is correct.**

Reference: *LSS Primer*, Section II - 22 and 28/29.

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- 2.25. The difference between strategic goals and the strategic business plan is that:
- Strategic goals are often a lower tier than the strategic business plan
  - They are determined by top management only
  - They may offer conflicting priorities
  - They are based on priorities given by all levels of the company

Solution: The key word in this question is "difference." Answers **b**, and **d** are common to both strategic quality goals and the strategic business plan. Answer **c** is incorrect. The strategic business plan forms the higher level, with strategic quality goals being a part of it. Answer **a** is correct.

**Answer a is correct.**

Reference: *LSS Primer*, Section II - 44 and 46/47 (and logic).

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- 2.26 What would occur if the quality goals were not a part of the strategic plan?
- There would be no strategic goals
  - There would not be as much emphasis on quality
  - The total quality effort would not suffer
  - The quality department would still maintain the quality goals

Solution: Strategic goals could exist without a quality element. Therefore, answer **a** is not correct. Answer **b**, lack of emphasis, can occur. The total quality effort would possibly suffer if it was not part of the strategic plan. The quality effort needs commitment from top management. Therefore, answer **c** is not a correct statement. Quality department goals (answer **d**) would not be strategic in nature. The best choice is answer **b**.

**Answer b is correct.**

Reference: *LSS Primer*, Section II - 42/44 (and logic).

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- 2.27. Which American figure is seen as the earliest advocate of waste reduction?
- Henry Ford
  - Frederick W. Taylor
  - W. Edwards Deming
  - James Womack

Solution: Henry Ford's dramatic gains in his Highland Park and River Rouge plants could be seen as the earliest examples of waste reduction.

**Answer a is correct.**

Reference: *LSS Primer*, Section II - 14.

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### LEAN SIX SIGMA GOALS - SAMPLE QUESTIONS

- 2.28. A company has just started a lean six sigma initiative. Which set of tools would be better suited for initial projects?
- Lean tools because they provide stability and repeatability for future projects
  - Six sigma tools because they provide a larger number of available options
  - Lean tools because they provide a more reliable and accurate picture of the root cause
  - Six sigma tools because they provide more measurement data

Solution: Lean tools often precede six sigma approaches. A lot can be gained from the application of simple and powerful lean techniques. Data collected from this effort will guide further improvements.

**Answer a is correct.**

Reference: *LSS Primer*, Section II - 3.

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- 2.29. Which of the following quality luminaries would be most clearly identified as a proponent of improvement and breakthrough projects?
- Ishikawa
  - Deming
  - Juran
  - Crosby

Solution: Juran's Trilogy consists of three processes: quality planning, quality control, and quality improvement. The quality improvement phase would certainly be considered a project approach to improvement.

**Answer c is correct.**

Reference: *LSS Primer*, Section II - 33 (and logic).

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- 2.30. Strategic plan implementation at the functional level requires:
- Functional level metrics
  - A company quality policy with everyone understanding it
  - Functional short and long-term strategic goals
  - A customer focus

Solution: Strategic plans require long and short-term goals. Therefore, strategic plan implementation at the functional level would contain short and long term goals.

**Answer c is correct.**

Reference: *LSS Primer*, Section II - 44 (and logic).

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