

# IASSC Black Belt Certification Practice Test 1 Correction and Explanation

This comprehensive guide offers 150 questions, complete with detailed corrections and explanations, designed to help you prepare for the IASSC Black Belt exam.

For additional resources, please visit my website:

<https://www.6sigmatool.com/>

Your feedback is invaluable in enhancing this document.

Should you have any suggestions or comments, feel free to reach out to me at

[outilssixsigma@gmail.com](mailto:outilssixsigma@gmail.com)

## Compendium of Questions and Corresponding Answers:

Que	Ans	Que	Ans	Que	Ans	Que	Ans	Que	Ans	Que	Ans
1	B	26	C	51	A	76	B	101	D	126	A
2	B	27	D	52	B	77	D	102	B	127	C
3	B	28	A	53	A	78	B	103	B	128	C
4	D	29	B	54	F	79	C	104	C	129	A
5	E	30	A	55	A	80	A	105	A	130	C
6	B	31	A	56	B	81	B	106	D	131	C
7	D	32	A	57	A	82	A	107	A	132	A
8	D	33	D	58	C	83	A	108	D	133	C
9	A	34	B	59	B	84	E	109	D	134	B
10	A	35	B	60	A	85	C	110	B	135	B
11	D	36	B	61	C	86	C	111	B	136	B
12	D	37	B	62	A	87	A	112	A	137	C
13	C	38	D	63	B	88	C	113	A	138	C
14	C	39	B	64	C	89	C	114	B	139	A
15	D	40	D	65	C	90	A	115	D	140	D
16	D	41	C	66	B	91	C	116	C	141	E
17	A	42	B	67	C	92	C	117	B	142	C
18	A	43	B	68	B	93	B	118	E	143	B
19	B	44	C	69	D	94	C	119	D	144	D
20	A	45	A	70	B	95	A	120	A	145	C
21	A	46	D	71	C	96	D	121	D	146	A
22	C	47	A	72	D	97	D	122	A	147	D
23	C	48	E	73	A	98	C	123	B	148	A
24	D	49	A	74	D	99	C	124	C	149	C
25	D	50	B	75	A	100	D	125	C	150	D

## LSS BoK 1.1 - The Basics of Six Sigma: 6 Questions

### Question 1/6 or 1/150:

Which statistical parameter is used to estimate the probability of a defect?

- A) The mean
- B) The sigma level
- C) The standard deviation
- D) It is not possible to determine this probability

The correct answer is B) The sigma level.

In Lean Six Sigma, the sigma level is used to estimate the probability of a defect occurring in a process. The sigma level represents how far a process deviates from perfection, based on the standard deviation and the mean of the process. A higher sigma level indicates fewer defects and a process that is closer to being defect-free. The sigma level is directly related to the defect rate, where a higher sigma level corresponds to a lower probability of defects.

The table below provides the relationship between Sigma Level and the corresponding percentage of defects.

Sigma Level	Defects Per Million Opportunities (DPMO)	Percent Defective
1	691,462	69.146%
2	308,538	30.854%
3	66,807	6.681%
4	6,210	0.621%
5	233	0.0233%
6	3.4	0.00034%

While the mean (A) and the standard deviation (C) are important statistical parameters in understanding a process, they do not directly estimate the probability of a defect in the same way that the sigma level does. Option D) It is not possible to determine this probability is incorrect because it is indeed possible to estimate the probability of a defect using statistical methods in Lean Six Sigma.

Question 2/6 or 2/150:

Who is most famous for the widespread deployment of Six Sigma at General Electric in 1995?

- A) Bob Galvin
- B) Jack Welch
- C) Bill Smith
- D) Joseph Juran

The correct answer is B) Jack Welch.

Jack Welch, as the CEO of General Electric, was renowned for his role in the widespread deployment of Six Sigma within the company in 1995. His leadership and strong endorsement of Six Sigma methodologies were pivotal in embedding these practices into GE's operations, significantly improving process efficiency and quality. Welch's influence extended beyond GE, as his success with Six Sigma inspired many other organizations to adopt similar approaches.

Question 3/6 or 3/150:

A successful Six Sigma program should reduce the need for management to maintain quality.

- A) True
- B) False

The correct answer is B) False.

A successful Six Sigma program does not reduce the need for management to maintain quality; rather, it changes the nature of their involvement. In Six Sigma, management plays a crucial role in setting quality objectives, providing resources, and ensuring continuous improvement. While Six Sigma tools and techniques help in identifying, reducing, and controlling variability in processes, the oversight and commitment of management are essential to sustain quality improvements. Management's ongoing involvement is key to fostering a culture of quality and continuous improvement within the organization.

Question 4/6 or 4/150:

If Y is discrete and binary (for example: "conforming" or "non-conforming"), the resulting  $Y = f(X)$  model:

- A) Cannot be calculated
- B) Requires a specific two-level experimental design
- C) Can be calculated by classical regression using categorical predictive variables
- D) Can be calculated by logistic regression with an evaluation of the P-value, and values of the coefficient of determination ( $R^2$ )

The correct answer is D) Can be calculated by logistic regression with an evaluation of the P-value, and values of the coefficient of determination ( $R^2$ ).

When the response variable (Y) is discrete and binary, such as "conforming" or "non-conforming," logistic regression is the appropriate statistical method for modeling the relationship between Y and one or more predictor variables (X). Unlike classical linear regression which assumes a continuous response variable, logistic regression is designed for binary outcomes and provides estimates of the probability of a certain class or event existing. The model includes an evaluation of the P-value to assess the significance of the predictors, and the coefficient of determination ( $R^2$ ) to understand the proportion of variance in the dependent variable that is predictable from the independent variables.

Question 5/6 or 5/150:

Data on Voice of the Customer (VOC) cannot be obtained in a reactive and/or proactive manner with:

- A) Customer surveys
- B) Interviews with customers
- C) Market research
- D) Satisfaction surveys
- E) A market-leading position

The correct answer is E) A market-leading position.

A market-leading position does not directly provide a method for obtaining Voice of the Customer (VOC) data in either a reactive or proactive manner. VOC is typically gathered through direct methods of customer engagement and research, such as customer surveys (A), interviews with customers (B), market research (C), and satisfaction surveys (D). These methods actively solicit feedback and opinions from customers. In contrast, merely having a market-leading position does not inherently provide specific or actionable customer feedback, and it does not constitute a method for gathering VOC data.

Question 6/6 or 6/150:

The responsibility of a Black Belt is to:

- A) Lead a large-scale project completely autonomously, independent of Green Belts
- B) Lead a large-scale project, possibly including sub-projects led by Green Belts.
- C) Lead a medium-scale project under the supervision of a Master Black Belt
- D) Select projects throughout the enterprise

The correct answer is B) Lead a large-scale project, possibly including sub-projects led by Green Belts.

In Lean Six Sigma, Black Belts are trained to lead large-scale projects. They possess advanced knowledge of Six Sigma methodologies and are skilled in managing complex projects that often require significant change. Black Belts may also oversee sub-projects that are led by Green Belts, providing guidance and mentorship. While Black Belts work independently on the technical aspects of Six Sigma projects, they typically collaborate with other team members, including Green Belts, to ensure project success. Their role is more hands-on with project execution compared to Master Black Belts, who may have a more strategic and supervisory role.



## LSS BoK 1.2 - The Fundamentals of Six Sigma : 5 Questions

### Question 1/5 or 7/150:

Before being able to describe a process, it is essential for a company to consider the information needed to manage and control this process. A Belt should consider the following questions: Why do we have this project? Who is it for? Therefore, the Belt must determine:

- A) The solution
- B) The process mapping
- C) The problem
- D) The objective

The correct answer is D) The objective.

Before describing a process, it's vital to understand the underlying objective of the project. This includes clarifying the purpose and the intended beneficiaries of the project. By asking questions like "Why do we have this project?" and "Who is it for?", a Belt can focus on the goals and desired outcomes. This helps in aligning the process improvements or interventions with the strategic objectives of the organization. Understanding the objective is a critical first step before diving into problem identification, solution development, or process mapping.

Question 2/5 or 8/150:

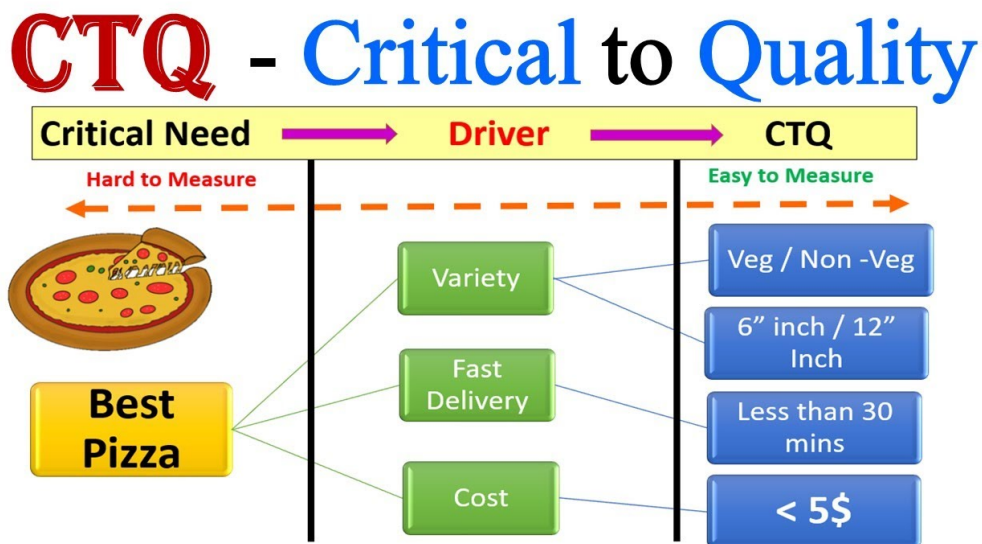
Which term best describes the following definition: A mapping process that creates measurable characteristics of a service to a customer?

- A) Critical to Process Tree (Critical to Process)
- B) Critical to Customer Tree (Critical to Customer)
- C) Critical to Business Tree (Critical to Business)
- D) Critical to Quality Tree (Critical to Quality)

The correct answer is D) Critical to Quality Tree (Critical to Quality).

This term refers to a mapping process that creates measurable characteristics of a service to a customer. Critical to Quality (CTQ) factors are crucial for focusing on customer requirements and establish the foundation for setting appropriate measures to assess performance. They are pivotal in defining measurable requirements based on customer needs.

Extra, Picture Critical to Quality Tree:



Source: <https://www.youtube.com/watch?v=NMV5uQ5uITl>

Question 3/5 or 9/150:

As a private investor, Jacques is promised a sum of 25,000 euros in two years if he keeps his investment in his friend's manufacturing company. He is offered an annual interest rate of 4%. What is the net present value (NPV) of Jacques' investment?

- A) 23,114 euros
- B) 11,423 euros
- C) 15,625 euros
- D) 23,000 euros

The correct answer is A) 23,114 euros.

To find the net present value (NPV) of Jacques' investment, we use the NPV formula with the annual interest rate of 4% for 2 years. The NPV formula is:

$$\text{NPV} = \text{Future Value} / (1 + r)^n$$

Future Value = 25,000 euros

r (annual interest rate) = 4% or 0.04

n (number of years) = 2

Now, calculating the NPV:

$$\begin{aligned}\text{NPV} &= 25,000 / (1 + 0.04)^2 \\ &= 25,000 / 1.04^2 \\ &= 25,000 / 1.0816 \\ &= 23,114 \text{ euros (approximately)}\end{aligned}$$

Hence, Jacques' investment has a present value of approximately 23,114 euros.

Question 4/5 or 10/150:

The dotted blue line in the chart indicates:



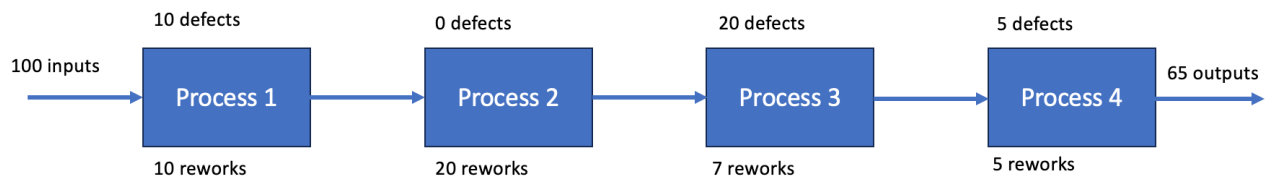
- A) The cumulative frequency of billing errors in %
- B) The % of errors
- C) The % of other billing errors
- D) The total number of errors

The correct answer is A) The cumulative frequency of billing errors in %.

The dotted blue line on a Pareto chart is used to depict the cumulative percentage of occurrences, helping to identify the most significant factors by demonstrating their proportion to the total. In this chart, it illustrates how each category of billing errors contributes cumulatively to the overall percentage of errors observed.

Question 5/5 or 11/150:

The complete process RTY is:



- A) 80%
- B) 65%
- C) 23%
- D) 37.33%

The correct answer is D) 37.33%.

To calculate the Rolled Throughput Yield (RTY), you multiply the yields of each process step together. Here's the calculation:

1. Process 1 Yield:  $\frac{100 \text{ inputs} - 10 \text{ defects} - 10 \text{ reworks}}{100} = \frac{80}{100} = 0.8$  or 80%
2. Process 2 Yield:  $\frac{90 \text{ inputs} - 20 \text{ reworks}}{90} = \frac{70}{90} \approx 0.7778$  or 77.78%
3. Process 3 Yield:  $\frac{70 \text{ inputs} - 20 \text{ defects} - 7 \text{ reworks}}{70} = \frac{43}{70} \approx 0.6143$  or 61.43%
4. Process 4 Yield:  $\frac{43 \text{ inputs} - 5 \text{ defects} - 5 \text{ reworks}}{43} = \frac{33}{43} \approx 0.7674$  or 76.74%

Now, calculate the RTY:

$$\text{RTY} = 0.8 \times 0.7778 \times 0.6143 \times 0.7674 \approx 0.3733$$

$$\text{RTY} = 0.8 \times 0.7778 \times 0.6143 \times 0.7674 \approx 0.3733 \text{ or } 37.33\%$$

Extra, comment:

The Rolled Throughput Yield (RTY) is calculated using the following formula:

$$\text{RTY} = Y_1 \times Y_2 \times Y_3 \times \dots \times Y_n$$

Where:

$Y_1, Y_2, Y_3, \dots, Y_n$  are the yields of each individual process step.

The yield for a single process step ( $Y_i$ ) is calculated as the number of good units (without defects) output from the process divided by the number of units put into the process.

In the context of a sequence of processes, RTY gives you the probability of a single unit passing through the entire process sequence without any defects or rework. It's important

to note that reworked items are not considered "good" on the first pass, so they should be deducted from the yield calculation for each process step.

## LSS BoK 1.3 - Selecting Lean Six Sigma Projects: 3 Questions

### Question 1/8 or 12/150:

At the end of the definition phase, a project charter states ambitious objectives without quantifying the key performance indicators (KPIs) of the processes. What should the project team and its sponsor do?

- A) Abandon the project
- B) Reduce the ambition of improvement
- C) Wait until the end of the measurement phase to know the precise level of performance without biased data
- D) Quantify the objectives and revise them later if necessary

The correct answer is D) Quantify the objectives and revise them later if necessary.

At the end of the Define phase in a Lean Six Sigma project, it is crucial to have clear and quantifiable objectives. If the project charter only states ambitious objectives without specific KPIs, the team should quantify these objectives to establish a clear direction and criteria for success. This allows the team to measure progress against these objectives during the project. If necessary, these objectives can be revised as more data becomes available or as the project scope evolves. Quantification also facilitates communication with stakeholders and keeps the project aligned with business goals.

Question 2/8 or 13/150:

A Belt has decided that their main KPI will be Process Cycle Efficiency (PCE), defined as the ratio of value-added time to Process Lead Time. Consequently, you should:

- A) Tell them that this is not the correct definition of PCE
- B) Tell them that their project is “Lean only” and that he/she should change the subject
- C) Tell them to add another KPI on variation to bring a “Six Sigma” dimension to their project
- D) Tell them to consider the effect of variation on this KPI, due to concerns of VOC/VOB/VOE

The correct answer is C) Tell them to add another KPI on variation to bring a “Six Sigma” dimension to their project.

Process Cycle Efficiency (PCE) is indeed a Lean metric focusing on the proportion of value-added time in a process. While it's a good measure of process flow and waste reduction, it doesn't address the variation within the process, which is a key component of Six Sigma. To incorporate the Six Sigma dimension, which focuses on reducing process variation and improving quality, the Belt should complement PCE with a KPI that measures variation. This could include metrics such as sigma level, defects per million opportunities (DPMO), or process capability indices like Cp or Cpk, which directly address the variability in the process.



Question 3/8 or 14/150:

The financial impact of the project can be measured as:

- A) A one-time event
- B) Sustainable savings over time
- C) A one-time event or savings over time
- D) A percentage of turnover

The correct answer is C) A one-time event or savings over time.

The financial impact of a Lean Six Sigma project can be manifested in two primary ways: as a one-time event where financial benefits are realized immediately after the project is completed, and as sustainable savings that accrue over time due to the continuous improvements made to the process. Some projects may deliver a combination of both, providing an initial cost reduction and ongoing savings. It's essential for a project team to identify, measure, and communicate both types of financial impact to stakeholders to demonstrate the full value of their Lean Six Sigma initiatives.

## LSS BoK 1.4 - The Lean Enterprise: 6 Questions

### Question 1/6 or 15/150:

Lean leaders lead from the Gemba, "where the truth lies." They know that the only way to truly understand what is happening is to follow the process at the heart of the action.

Therefore, they do all of the following, except:

- A) Genchi
- B) Genbutsu
- C) Genjitsu
- D) Hanedashi

The correct answer is D) Hanedashi.

Hanedashi refers to a device that automatically ejects parts from one process to the next in a production sequence, reducing the manual effort required to transfer items and thereby improving efficiency. The term is not related to the concept of leading from the Gemba, which emphasizes direct observation and understanding of the work process. Genchi Genbutsu and Genjitsu are concepts related to going to the actual place (Gemba), observing the actual product (Genbutsu), and understanding the actual situation (Genjitsu) to make informed decisions and improvements.

Question 2/6 or 16/150:

Who is the author of the term "Lean" in "Lean Manufacturing," a concept born in the 1990s?

- A) Jack Welch
- B) Shigeo Shingo
- C) W. Edwards Deming
- D) James Womack

The correct answer is D) James Womack.

The term "Lean" in "Lean Manufacturing" was first coined by John Krafcik in 1987 when he was a researcher at MIT as part of the International Motor Vehicle Program. However, the concept was popularized by James Womack and his colleagues through their work at MIT, which led to the publication of the book "The Machine That Changed the World".

Extra, Author's note:

Here we see that none of the answers is entirely correct.  
In such a case, we must choose the best available option.

Question 3/6 or 17/150:

The combination of Lean and Six Sigma:

- A) Can be achieved by adding Lean tools to a DMAIC cycle
- B) Can be achieved by integrating tools from each methodology into a PDCA cycle
- C) Is not achievable
- D) Should be done sequentially

The correct answer is A) Can be achieved by adding Lean tools to a DMAIC cycle.

The combination of Lean and Six Sigma methodologies can be effectively achieved by incorporating Lean tools into the Six Sigma DMAIC (Define, Measure, Analyze, Improve, Control) cycle. This integrated approach leverages the strengths of both methodologies: Lean focuses on eliminating waste and increasing process speed, while Six Sigma concentrates on reducing variation and improving quality. By adding Lean tools to the DMAIC cycle, organizations can improve efficiency and quality simultaneously, thereby enhancing overall process performance.

Question 4/6 or 18/150:

One of the methods used to identify the 7 wastes is:

- A) Gemba Walk
- B) Project charter creation
- C) Brainstorming
- D) Comparative analysis

The correct answer is A) Gemba Walk.

A Gemba Walk is an activity where managers and leaders go to the actual place where work is done, often referred to as the "front line" or the "shop floor." The purpose of this walk is to observe the actual work process, engage with employees, gain knowledge about the work, and identify opportunities for improvement, including the identification of wastes. This is in contrast to managing from a distance or relying solely on reports. Gemba Walks are a key part of the Lean methodology and are particularly effective in identifying the seven types of waste (transport, inventory, motion, waiting, over-processing, overproduction, and defects).

Extra, picture:



Source: <https://businessmap.io/lean-management/value-waste/7-wastes-of-lean>

In addition, It's important to recognize the presence of the 8th waste, often referred to as underutilized skills, within organizations. This waste arises when employees' talents and abilities are not fully utilized, leading to errors, inefficiencies, and missed opportunities. To mitigate this waste, companies should prioritize skills development, training, and foster a culture of continuous improvement to harness the full potential of their workforce.

Question 5/6 or 19/150:

Traditionally, the 7 wastes, also known as "Muda," include:

- A) Employee stress analysis
- B) Overproduction
- C) Data collection
- D) Physical inventory activities

The correct answer is B) Overproduction.

Overproduction is one of the traditional seven wastes (Muda) in Lean methodology.

Extra, author's note: to aid in remembering the 7 traditional wastes and the addition of the 8th waste, you can utilize the acronym "TIMWOODS."



Source: <https://opexlearning.com/resources/28695-2/28695/>

Question 6/6 or 20/150:

Which 5S concept emphasizes the need to place essential information where it's needed?

- A) Visual workplace
- B) Audits
- C) Clean desk policy
- D) Daily small group meeting

The correct answer is A) Visual workplace.

The 5S concept that emphasizes placing essential information where it's needed is part of the broader concept of a visual workplace. This approach involves using visual cues like signs, labels, and color-coding to communicate information quickly and effectively at the point of use. The visual workplace aligns with the "Set in Order" or "Seiton" principle in 5S, which focuses on efficient and effective storage and organization to ensure that items and information are easy to find and use.

Author's note,

Sort (Seiri):

This step involves going through all items and materials in a workspace and identifying what is necessary for the current work processes and what is not. Unneeded items are removed or relocated to declutter and free up space.

Set in order (Seiton):

After decluttering, the next step is to arrange the necessary items and materials in a systematic and organized manner. Each item should have a designated and easily accessible place. This step aims to improve efficiency and reduce waste by minimizing time wasted searching for items.

Shine (Seiso):

In this step, the workplace is thoroughly cleaned and maintained regularly. Cleaning helps identify potential issues such as leaks, equipment malfunctions, or safety hazards. A clean and organized workspace promotes safety and efficiency.

Standardize (Seiketsu):

Standardization involves establishing and documenting clear, consistent procedures and guidelines for maintaining the first three S's (Sort, Set in order, Shine). Standardization ensures that everyone follows the same practices and helps sustain the improvements made.

Sustain (Shitsuke):

Sustaining the improvements made in the previous steps is crucial for long-term success. This step involves creating a culture of continuous improvement and discipline within the organization. Regular audits, training, and ongoing reinforcement are essential to ensure that the 5S principles become a part of the organization's daily routine.

## LSS BoK 2.1 - Process Definition: 8 Questions

### Question 1/8 or 21/150:

It is possible that a team may find that once they have identified possible causes, they may need to investigate further to find a true root cause. For example, each root cause coming out of the main category of a "bone" could have one or more sub-causes stemming from it. At this stage, who can help lead the team to the true root cause?

- A) The 5 Whys
- B) A Pareto chart
- C) Hypothesis testing
- D) Waste analysis

The correct answer is A) The 5 Whys.

The 5 Whys technique is a simple but powerful tool for drilling down into the details of a problem to uncover its root cause. By repeatedly asking the question "Why?"—typically five times, but as many as needed—you can peel away the layers of symptoms to get to the underlying cause of a problem. This method is particularly effective in situations like the one described, where a team needs to delve deeper into each potential cause to identify the true root cause. The iterative questioning leads to deeper insights, helping the team to understand the cause-and-effect relationships underlying their problem.



Question 2/8 or 22/150:

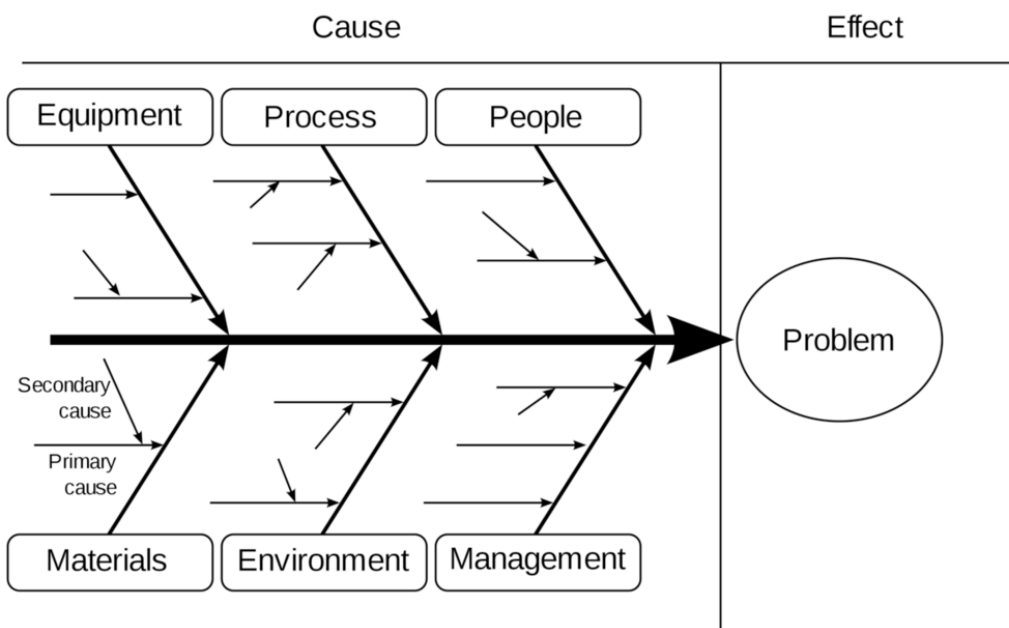
An Ishikawa diagram is also called:

- A) FMEA (Failure Modes and Effects Analysis)
- B) Process mapping
- C) Fishbone diagram
- D) Box plot

The correct answer is C) Fishbone diagram.

An Ishikawa diagram is commonly known as a Fishbone diagram due to its resemblance to the skeleton of a fish. It's a visual tool used for root cause analysis, where causes of a problem are categorized and visually represented, branching off a central 'spine'. This tool is particularly useful in brainstorming sessions to categorize and visualize the sources of variation or defects. It is not related to FMEA (Failure Modes and Effects Analysis), process mapping, or a box plot, which are different tools used in quality management and statistical analysis.

Extra, picture, Fishbone/Ishikawa diagram:



Source: <https://enlaps.io/us/guide/ishikawa-diagram.html>

Question 3/8 or 23/150:

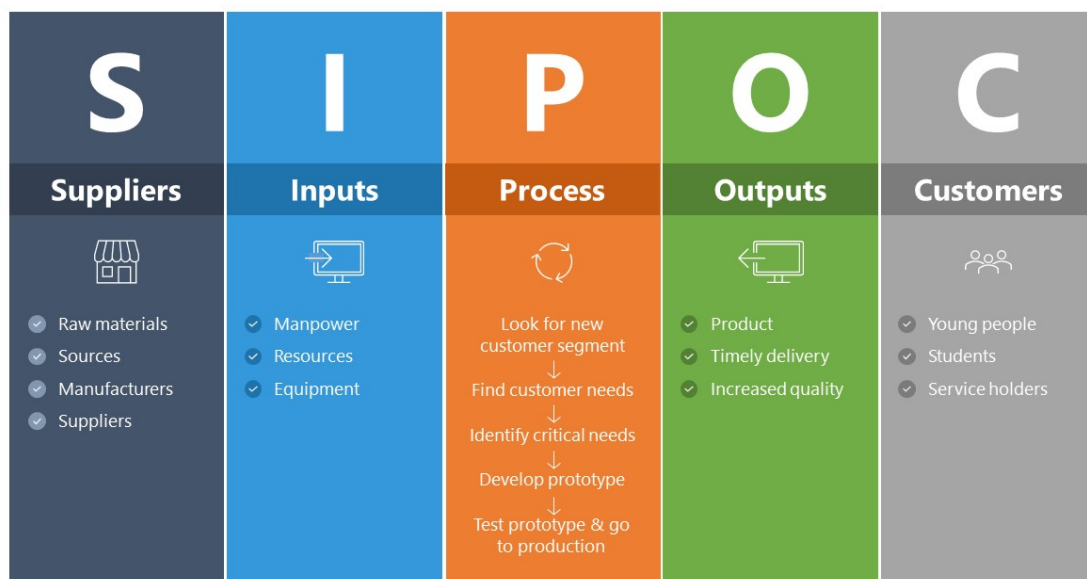
What is the main purpose of a SIPOC?

- A) Focus all attention on your customer
- B) Identify areas of waste in your process
- C) Help you understand what impacts your process
- D) Basis for a detailed process flowchart

The correct answer is C) Help you understand what impacts your process.

A SIPOC diagram (Suppliers, Inputs, Process, Outputs, Customers) is a tool used to provide a high-level view of a process. It is useful for understanding the interrelationships and impacts on a process, including identifying key elements like the suppliers, inputs, process steps, outputs, and customers. This global view is instrumental in pinpointing where to make baseline measurements and in understanding how each component fits into the overall process flow and relates to others in accomplishing the job.

Extra, Picture:



Source: <https://slidemodel.com/templates/sipoc-analysis-powerpoint-template/>

Question 4/8 or 24/150:

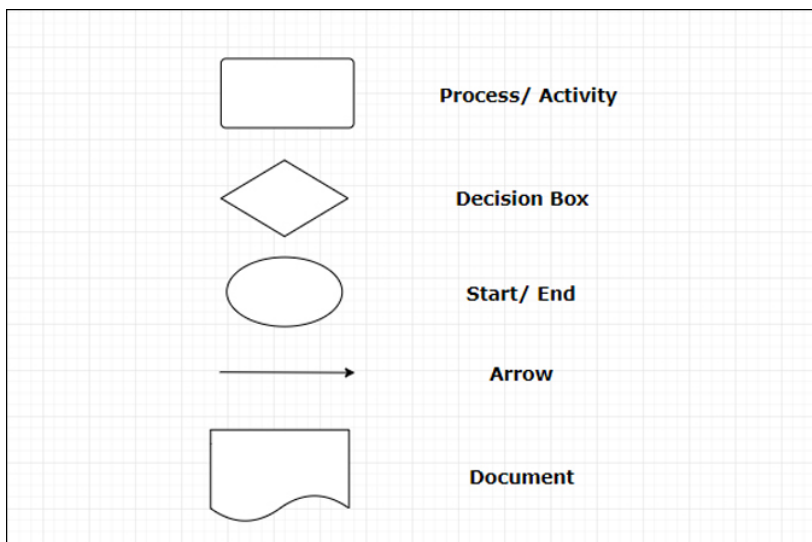
What is the standard symbol for "an activity or a process step" in process mapping?

- A) Diamond
- B) Ellipse
- C) Arrow
- D) Rectangle

The correct answer is D) Rectangle.

In process mapping, the standard symbol for "an activity or a process step" is a rectangle. This shape is commonly used in flow charts and process maps to denote an action step within the process, indicating that an activity is being performed, usually by people.

Extra, Picture:



Source: <https://gitmind.com/process-mapping.html>

Question 5/8 or 25/150:

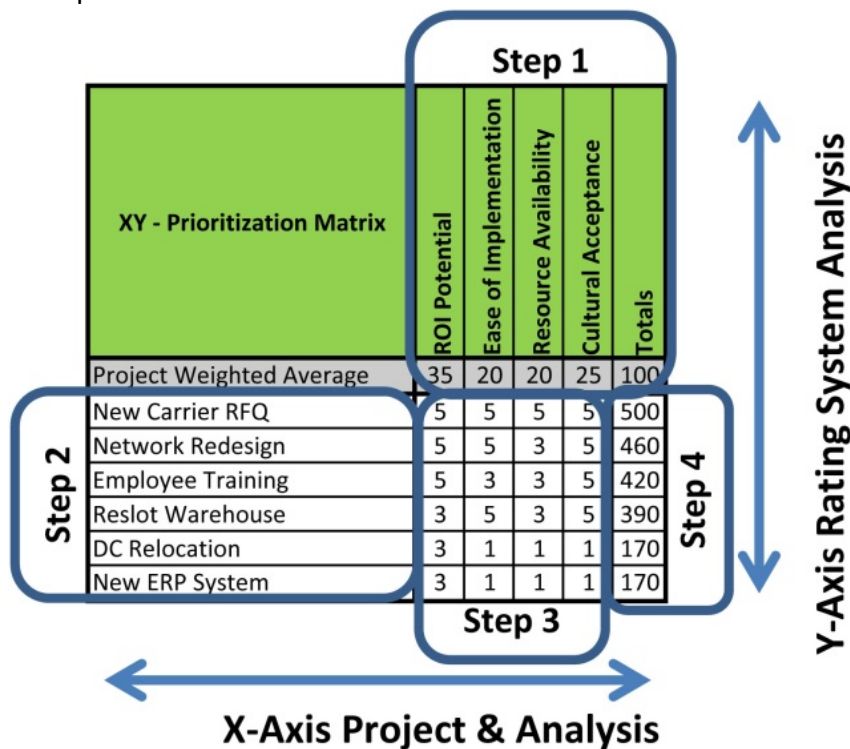
The X-Y diagram (prioritization matrix) is used as:

- A) A tool used in a team to prioritize potentially influential X's
- B) An objective tool
- C) A tool for the definition phase
- D) A team-based prioritization tool for potential X's

The correct answer is D) A team-based prioritization tool for potential X's.

The X-Y diagram, also known as the prioritization matrix, is a tool used in Six Sigma and Lean methodologies for prioritizing potential input variables (X's) that may influence the output variable (Y). This tool helps teams evaluate and rank the importance of different variables based on certain criteria. It is especially useful in the Analyze phase of the DMAIC cycle for systematically identifying the most critical factors to focus on for process improvement.

Example:



Source: <https://leanlogisticsblog.wordpress.com/2010/09/07/lean-defined-the-xy-project-selection-matrix/>