

Facilitator guide

81 workplace cases and method lessons / 166 pages. Select a chapter or use PDF bookmarks. Online links open the related lesson.

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Facilitator guide

Teach the methods through questions, practice and feedback.

OPEX LEARNING RESOURCES / FICTIONAL TEACHING CASES

Help learners explain a method, use it on a bounded case, distinguish evidence from a proposal and choose the next response.

13 workplace cases and 68 detailed method lessons. One habit: make the condition clear, choose a useful test and verify the response.

Use this resource with the individual OPEX sample reports and the separate teaching cards. Existing case figures are authored examples. Additional calculations are marked new fictional exercises. Blank records must be completed from an actual authorized observation or a clearly labelled role-play.

Evidence stays separate. A generated image, posted checklist or filled training sheet does not establish a completed improvement, safe operation or a Sustain score.

Read the case, use the practice, then take one bounded next step with the people doing the work. Preserve approved work, privacy and technical controls.

[Open the OPEX example library](#) | [Open the training library](#)

Prepare a useful learning session

Choose the case that matches the learner's work; do not try to rush the entire curriculum.

BEFORE THE SESSION

Read the selected case report and its two teaching cards. Print the relevant workbook pages and keep the answer key separate. Check names, units and evidence labels. Arrange pairs or a small working group and select a facilitator familiar with the work.

A PROPOSED 25-MINUTE CASE ROUTINE

Frame the need (3 min), demonstrate the method (6), practise in pairs (9), debrief reasoning (5), agree transfer to work (2). These are adjustable learning-design timings, not a Lean standard.

TWO WORKSHOP OPTIONS

Beginner: cafe, pantry and office, with breaks and a final transfer task. Practitioner: select one problem-solving case, one flow/equipment case and the relevant calculation exercise. Use real observations only with permission and appropriate privacy controls.

DURING PRACTICE

Ask learners to make a prediction, trace arrows, reproduce a calculation or explain a decision. Show the answer only after their reasoning is visible. Treat disagreement as a prompt to identify missing evidence.

CLOSE THE LOOP

Have each learner name a bounded next test, an accountable partner, evidence to collect and a review date. Follow up on application and misunderstanding; attendance or a completed quiz alone does not demonstrate competence.

The connected curriculum

Concepts 1-6 / 24. Use the named home case, then connect learning back to daily work.

01 / LEAN PURPOSE

Name the customer outcome and follow the whole route before choosing a tool. A local improvement must not move waiting or defects outside the boundary.

Home: services-vsm

02 / OBSERVATION AND GEMBA

Record facts, conditions and respectful questions where the work occurs. Separate observation from explanation; a photograph is not an employee assessment.

Home: cnc-tool-room

03 / PDCA AND PDSA

Make a prediction, run a small test, study the result and choose the next action. A faster result without the quality balance does not close the learning loop.

Home: cafe-reset

04 / A3 THINKING

Connect current condition, target, analysis, countermeasure and follow-up. A completed form is not evidence that its causal links are correct.

Home: healthcare-a3

05 / 8D

Protect affected customers while verifying occurrence and escape causes. D0 is preparation; containment remains until authorized effectiveness criteria are met.

Home: manufacturing-8d

06 / DMAIC

Move an existing process through five evidence gates, ending with a response mechanism. A Pareto ranks categories; it does not confirm root cause.

Home: logistics-dmaic

The connected curriculum

Concepts 7-12 / 24. Use the named home case, then connect learning back to daily work.

07 / DAILY MANAGEMENT

Turn a visible gap into a receiving owner, due response and verified follow-through. Assignment is a promise; closure requires verification.

Home: construction-daily-management

08 / 6S

Use Sort, Set, Shine, Standardize and Sustain with Safety explicit throughout. Shine includes inspection and response; Sustain needs repeated evidence.

Home: hospitality-6s

09 / STANDARDIZED WORK AND TEACH-BACK

Agree the current method and have another person demonstrate sequence and exceptions. Production standardized work also relates takt, work sequence and necessary in-process stock.

Home: cafe-reset

10 / TPM AND OPERATOR CARE

Connect trained operator checks with qualified maintenance and loss prevention. A cleaning rota alone is not TPM or authorization for technical repairs.

Home: cnc-tool-room

11 / EQUIPMENT CONDITION AND MAINTENANCE

Link condition, trends, defects, work due and verified response under an accountable owner. Scheduled preventive work is not automatically predictive maintenance.

Home: extrusion-press

12 / OEE

Reconcile availability, performance and first-pass quality using consistent boundaries. The factor shows a loss class, not a cause, reliability grade or universal target.

Home: extrusion-press

The connected curriculum

Concepts 13-18 / 24. Use the named home case, then connect learning back to daily work.

13 / VALUE-STREAM MAPPING

Show the material/request route and returning information, including queues and touch time. A proposed future state is a hypothesis; processing is not automatically value-added.

Home: services-vsm

14 / OFFICE OWNERSHIP

Define ready, next owner, blocked condition and accepted completion for the request. A board helps only if its rules change actual decisions and responses.

Home: office-handoff

15 / PULL AND KANBAN

Let consumption or agreed capacity authorize the next start or refill. Material flows toward use; the replenishment request travels back upstream.

Home: window-assembly

16 / MIN-MAX

Declare inventory position, trigger, target, rounding and exceptions before calculating an order. Already-on-order units must not be ordered twice; settings are local assumptions.

Home: hospitality-6s

17 / FIFO

Control both sequence and finite capacity, including full-lane and exception responses. A row of stored items without an entry/exit/capacity rule is not a working FIFO system.

Home: saw-cutting

18 / TAKT, CYCLE AND LEAD TIME

Keep the demand rhythm, operation duration and end-to-end elapsed time distinct. Use the same time period and consistent units when calculating takt.

Home: window-assembly

The connected curriculum

Concepts 19-24 / 24. Use the named home case, then connect learning back to daily work.

19 / YAMAZUMI

Stack identified work elements and test a feasible redistribution against takt. Preserve work content and precedence; bars do not prove a staffing decision.

Home: window-assembly

20 / HEIJUNKA AND PITCH

Release an agreed mix at a feasible rhythm; pitch is takt multiplied by pack quantity. Leveling cannot authorize unwanted output or ignore changeover constraints.

Home: window-assembly

21 / SMED

Observe change work, separate internal/external tasks and simplify only with authorization. Do not move a task that needs a controlled equipment state into running time.

Home: saw-cutting

22 / QUALITY AT SOURCE

Make correct conditions clear and verify prevention, detection and abnormality response. A hold releases only after resolution and required verification.

Home: fabrication-welding

23 / CAUSE ANALYSIS

Use patterns to formulate explanations and discriminating tests, retaining contrary evidence. Fishbone, Pareto and repeated why questions organize inquiry; they do not prove causality.

Home: manufacturing-8d

24 / MEASUREMENT AND CONTROL RESPONSE

Define unit, boundary, denominator, comparable conditions and action when a signal occurs. A target line is not a statistical control limit; do not delete inconvenient observations.

Home: logistics-dmaic

Stop the recurring leak

8D + cause verification

FACILITATOR / MANUFACTURING-8D

LEARNING OUTCOME

Separate containment, correction and verified corrective action.

25-minute design: 3 frame / 6 demonstrate / 9 practise / 5 debrief / 2 transfer

DEMONSTRATE

Use the 144/2400 baseline and two fixture rates. Ask the group to mark what the data show and what they do not. Keep an interim-containment card in view while testing both occurrence and escape explanations.

PRACTICE IN PAIRS

Ask two pairs to propose competing predictions for the same fixture association. Require an observation that would contradict each explanation.

WATCH FOR THESE MISTAKES

Treating a Pareto category or association as a proved cause; retiring containment when a change is merely installed; mixing pilot and validation denominators.

DEBRIEF THE REASONING

- What protects affected customers while the test runs?
- What result could disprove the explanation?
- Who can retire containment, using what evidence?

LOOK FOR APPLICATION, NOT RECALL

- Quantifies product, defect, period and denominator.
- Separates occurrence and escape hypotheses and predicts a discriminating comparison.
- Keeps containment until the authorized effectiveness gate is met.

Concepts: 05, 23, 24 | Sources: Q05, Q10, Q11 | [Case report](#)

Make referrals ready

A3 thinking + administrative gemba

FACILITATOR / HEALTHCARE-A3

LEARNING OUTCOME

Build an A3 whose proposed countermeasure follows from the observed gap.

25-minute design: 3 frame / 6 demonstrate / 9 practise / 5 debrief / 2 transfer

DEMONSTRATE

Draw Receive, Review, Route and Confirm. Show 62/100 ready packets and the three rework categories 21/11/6. Connect one observation to one proposed test; leave the causal link marked as a question.

PRACTICE IN PAIRS

Have one learner explain the story while another asks, What evidence connects those two boxes? Keep administrative information fictional and anonymous.

WATCH FOR THESE MISTAKES

Starting with a preferred form or software solution; confusing readiness with elapsed time; hiding reopened work or exposing patient details.

DEBRIEF THE REASONING

- Which link is still a hypothesis?
- Where might the new check create another queue?
- What would make you revise the countermeasure?

LOOK FOR APPLICATION, NOT RECALL

- Uses one administrative boundary and a named owner.
- Connects current condition, target, analysis, trial and follow-up.
- Protects the reopened-case balance alongside readiness and lead time.

Concepts: 02, 04, 14 | Sources: Q04, Q07, Q03 | [Case report](#)

Send the right shipment

DMAIC + measurement + control

FACILITATOR / LOGISTICS-DMAIC

LEARNING OUTCOME

Define an error-containing shipment, use patterns to choose a test and write a reaction plan.

25-minute design: 3 frame / 6 demonstrate / 9 practise / 5 debrief / 2 transfer

DEMONSTRATE

Count one carton with two errors once in the shipment-level measure. Show $120/3000 = 4\%$, then the 66/36/18 primary classification. Contrast the target with a statistical control limit.

PRACTICE IN PAIRS

Ask learners to design a fair comparison of adjacent look-alike SKU locations and other locations, with denominators and order-mix conditions recorded.

WATCH FOR THESE MISTAKES

Double-counting error-containing shipments; assuming the tallest Pareto bar is a cause; treating the 1% goal as a control limit; overlooking throughput.

DEBRIEF THE REASONING

- What exactly is counted once?
- Which conditions must remain comparable?
- Who acts if error falls but throughput deteriorates?

LOOK FOR APPLICATION, NOT RECALL

- Defines unit, error, denominator and window.
- Separates association from mechanism and proposes a bounded trial.
- Names a reaction owner and protects at least 220 lines per labour-hour.

Concepts: 06, 23, 24 | Sources: Q06, Q10, S03 | [Case report](#)

Find it. Use it. Reset it.

6S + routine + replenishment

FACILITATOR / HOSPITALITY-6S

LEARNING OUTCOME

Turn an organized pantry into a usable reset and replenishment routine.

25-minute design: 3 frame / 6 demonstrate / 9 practise / 5 debrief / 2 transfer

DEMONSTRATE

Walk a fictional item through Find, Use and Return. Contrast a posted reset card with repeated logs of missed checks and responses. Explain the separate $34+6=40$ inventory-position exercise.

PRACTICE IN PAIRS

Pairs specify a refill signal and a next-shift verification. Let one pair deliberately omit the on-order quantity so the other catches double-ordering.

WATCH FOR THESE MISTAKES

Scoring Sustain from a picture; setting stock minimums by appearance; counting unusable stock; ordering the pending six twice.

DEBRIEF THE REASONING

- What is the normal condition?
- What evidence would show the reset holds across shifts?
- Which inventory terms would change the order decision?

LOOK FOR APPLICATION, NOT RECALL

- Names item identity, home, reset owner and abnormality response.
- Treats 126 seconds and 60 seconds as baseline/goal, not before/after results.
- Computes the separate exercise as 30 additional units and explains its assumptions.

Concepts: 08, 15, 16 | Sources: F16, F09, F05, Q08 | [Case report](#)

Shorten the handoffs

Lean + VSM + office flow

FACILITATOR / SERVICES-VSM

LEARNING OUTCOME

Map waiting, processing and information returns across the whole request route.

25-minute design: 3 frame / 6 demonstrate / 9 practise / 5 debrief / 2 transfer

DEMONSTRATE

Build the four-stage map with queue times 6.4,13.6,11.2,8.8 hours and touch times 8,12,10,6 minutes. Keep business-hour units separate until converting.

PRACTICE IN PAIRS

Ask learners to trace one clarification backward, then test whether a proposed local improvement moves waiting outside the map.

WATCH FOR THESE MISTAKES

Calling all processing value-added; summing minutes directly with hours; presenting a future-state drawing as a result; optimizing only one queue.

DEBRIEF THE REASONING

- Where does information return?
- What boundary prevents shifting the wait?
- What actual observations would verify the future state?

LOOK FOR APPLICATION, NOT RECALL

- Reproduces 40 hours queue + 0.6 hours touch = 40.6 hours.
- Shows forward work and backward information.
- Keeps 15.58-hour future state as an untested hypothesis and checks completeness/rework.

Concepts: 01, 13, 18 | Sources: F07, F08, S01 | [Case report](#)

Make tomorrow ready

Daily management + gemba + escalation

FACILITATOR / CONSTRUCTION-DAILY-MANAGEMENT

LEARNING OUTCOME

Run a short huddle that produces a verified response to a real constraint.

25-minute design: 3 frame / 6 demonstrate / 9 practise / 5 debrief / 2 transfer

DEMONSTRATE

Display 82/120 completed commitments and keep all 120 in the denominator. Take one existing missing prerequisite through owner, due time, receiving leader and verification.

PRACTICE IN PAIRS

Role-play local team, supervisor and support owner. Assigning the issue is not the end; ask the receiving person to state what evidence will close it.

WATCH FOR THESE MISTAKES

Deleting missed commitments from the denominator; assuming a green card authorizes work; closing on assignment; leaving escalation without a receiving owner.

DEBRIEF THE REASONING

- What must be true before tomorrow's promise is credible?
- Who receives the escalation?
- What shows the response worked?

LOOK FOR APPLICATION, NOT RECALL

- Defines commitment completion and keeps due/finished counts.
- Names prerequisite, owner, due point and receiving response.
- Closes only after verification, with immediate concerns using existing routes.

Concepts: 07, 02, 24 | Sources: Q08, Q07, Q01 | [Case report](#)

Make the morning easier

6S through a small PDCA experiment

FACILITATOR / CAFE-RESET

LEARNING OUTCOME

Run one bounded PDCA test and teach the reset to another shift.

25-minute design: 3 frame / 6 demonstrate / 9 practise / 5 debrief / 2 transfer

DEMONSTRATE

Use one shelf. Define the same retrieval start/finish and a prediction. Show a blank ten-task record; do not invent historical observations behind the authored 95-second summary.

PRACTICE IN PAIRS

One learner teaches the reset and another demonstrates it, including what to do if the item is wrong or absent. Debrief speed together with selection errors.

WATCH FOR THESE MISTAKES

Calling a prettier shelf improvement; measuring different tasks before and after; filling future data from an image; treating ten trials as proof of long-term Sustain.

DEBRIEF THE REASONING

- What did you predict?
- What would make you adapt rather than adopt?
- Can the next shift explain the exception response?

LOOK FOR APPLICATION, NOT RECALL

- States a small change, prediction and consistent task boundary.
- Uses actual blank-sheet observations with a quality balance.
- Makes an evidence-based keep/adapt/abandon decision and checks teach-back.

Concepts: 03, 08, 09 | Sources: Q01, Q03, F10, F16, S02 | [Case report](#)

Give the request a clear next step

Office management + ownership + pull

FACILITATOR / OFFICE-HANDOFF

LEARNING OUTCOME

Trace five requests and make the next owner, readiness and blocked work visible.

25-minute design: 3 frame / 6 demonstrate / 9 practise / 5 debrief / 2 transfer

DEMONSTRATE

Create one fictional request card. Move it only when entry criteria and capacity allow. Contrast visible ownership with putting every arrival in In progress.

PRACTICE IN PAIRS

Pairs trace five actual or role-play requests using the blank sheet. Require a reason and acknowledgement for every transfer; retain necessary approvals.

WATCH FOR THESE MISTAKES

Inventing a seven-step route from the seven-handoff summary; deleting controls to reach three; confusing board activity with completed customer outcomes.

DEBRIEF THE REASONING

- What makes this request ready?
- Who owns the next action while it waits?
- How will you check completion and rework?

LOOK FOR APPLICATION, NOT RECALL

- Defines a counted handoff and records the actual route.
- Makes one accountable next owner and blocked-work response visible.
- Preserves approvals and compares whole-request outcomes.

Concepts: 14, 15, 03 | Sources: F08, Q07, Q01 | [Case report](#)

A tool room ready for the next job

Tool readiness + clean/inspect/respond

FACILITATOR / CNC-TOOL-ROOM

LEARNING OUTCOME

Connect a tool-return standard and authorized condition observation to a verified response.

25-minute design: 3 frame / 6 demonstrate / 9 practise / 5 debrief / 2 transfer

DEMONSTRATE

Use a known tool with uncertain verification status. Keep ready and hold locations distinct. Show an abnormality ticket that routes residue recurrence to qualified maintenance.

PRACTICE IN PAIRS

Pairs describe normal, observed abnormality, trained operator action and maintenance handover. Ask what comparable follow-up would demonstrate that the source was addressed.

WATCH FOR THESE MISTAKES

Returning a suspect tool to a tidy ready-home; calling wiping a source correction; assigning technical repairs to untrained operators; equating search time with reliability.

DEBRIEF THE REASONING

- What can the operator check within training?
- What must be escalated?
- Which recurrence observation will close the loop?

LOOK FOR APPLICATION, NOT RECALL

- Preserves identity and verification status.
- Separates authorized routine care from maintenance-owned technical work.
- Names owner, response and comparable recurrence verification.

Concepts: 02, 10, 11 | Sources: F01, F02, F03, S04 | [Case report](#)

Give the press area a clear reset

Preparation readiness + TPM/OEE

FACILITATOR / EXTRUSION-PRESS

LEARNING OUTCOME

Separate preparation readiness from changeover time, then explain equipment losses using declared boundaries.

25-minute design: 3 frame / 6 demonstrate / 9 practise / 5 debrief / 2 transfer

DEMONSTRATE

Show the next-job kit list and ready/hold distinction. Then use the separate OEE worksheet: planned 450, run 360, ideal 0.5, total 600, first-pass-good 570.

PRACTICE IN PAIRS

Assign one group availability, one performance and one quality. Reconcile their factors with equivalent productive minutes before discussing possible investigations.

WATCH FOR THESE MISTAKES

Calling a four-minute search goal a four-minute changeover; substituting search data for OEE; changing denominators; including reworked units as first-pass good.

DEBRIEF THE REASONING

- What exactly starts/stops the search clock?
- Which loss component is largest in the exercise?
- What further evidence is needed before selecting a maintenance response?

LOOK FOR APPLICATION, NOT RECALL

- Keeps search, technical changeover and OEE distinct.
- Uses first-pass good output and consistent planned/run boundaries.
- Computes 63.33% and investigates losses without claiming a cause.

Concepts: 10, 11, 12 | Sources: F01, F03, F04, F15, F18 | [Case report](#)

Make the welding bay ready to work

Kit standard + quality at source

FACILITATOR / FABRICATION-WELDING

LEARNING OUTCOME

Design and test a kit identity cue and an abnormality response at the source.

25-minute design: 3 frame / 6 demonstrate / 9 practise / 5 debrief / 2 transfer

DEMONSTRATE

Contrast a shaped fixture home with a final visual check. Show pass-to-release and mismatch-to-hold, with release from hold only after resolution and verification.

PRACTICE IN PAIRS

One pair designs a proposed cue; another tries to find a plausible error the cue would not prevent. Keep fixture/consumable technical suitability outside the classroom assumption.

WATCH FOR THESE MISTAKES

Claiming a cue is error-proof without challenge testing; treating detection as prevention; using blame as cause; releasing from hold merely because someone was assigned.

DEBRIEF THE REASONING

- Which error could this cue prevent?
- Which error could still escape?
- What permits release from hold?

LOOK FOR APPLICATION, NOT RECALL

- States the correct identity/readiness condition and the specific error.
- Distinguishes prevention from detection and defines a test.
- Includes hold, response owner and verified release.

Concepts: 22, 23, 09 | Sources: Q09, Q10, Q07, F10 | [Case report](#)

Keep the assembly line ready for the next frame

Part readiness + synchronized flow + yamazumi

FACILITATOR / WINDOW-ASSEMBLY

LEARNING OUTCOME

Connect consumption, replenishment information and verified parts; test a work-balance hypothesis.

25-minute design: 3 frame / 6 demonstrate / 9 practise / 5 debrief / 2 transfer

DEMONSTRATE

Use two arrows: material toward use, information back to supply. Then stack the 10 named elements of the separate exercise and move only E4, returning an empty tote.

PRACTICE IN PAIRS

Pairs retain the 210-second total, check takt from 400 minutes/300 units and challenge whether E4 can actually move safely and without hidden walking or precedence effects.

WATCH FOR THESE MISTAKES

Calling search time takt; showing only averages; moving unidentified work; treating balanced bars as staffing proof; forgetting mix/pack/changeover constraints.

DEBRIEF THE REASONING

- Which arrow requests refill?
- What does the stack omit about machine overlap?
- What evidence is needed before accepting the proposed transfer?

LOOK FOR APPLICATION, NOT RECALL

- Defines signal, quantity, responding owner and identity check.
- Preserves element IDs and total work while computing 80-second takt.
- Keeps feasibility, quality and real performance unverified until trial.

Concepts: 15, 18, 19, 20 | Sources: F05, F06, F09, F11, F13, F14, F17, F19 | [Case report](#)

A clearer start for every cut order

Stock identity + FIFO + SMED

FACILITATOR / SAW-CUTTING

LEARNING OUTCOME

Keep stock identity through FIFO and distinguish safe external preparation from controlled change work.

25-minute design: 3 frame / 6 demonstrate / 9 practise / 5 debrief / 2 transfer

DEMONSTRATE

Use a finite FIFO lane with explicit entry, exit and full-lane rule. Route an unidentified offcut to hold. On a separate sheet, observe change tasks before classifying internal/external.

PRACTICE IN PAIRS

Give pairs one job-information preparation task and one adjustment needing a controlled equipment state. Ask who authorizes classification and how first-good output is verified.

WATCH FOR THESE MISTAKES

Adding overflow piles to a full FIFO lane; relabelling unknown material as usable; equating search time with changeover; moving all work outside the stopped interval.

DEBRIEF THE REASONING

- What happens when capacity is full?
- What confirms material identity?
- Which task requires a controlled state and cannot simply be moved?

LOOK FOR APPLICATION, NOT RECALL

- Maintains identity and finite-capacity response.
- Defines consistent last-good to first-good change boundary.
- Moves only safe approved external preparation and verifies the resulting method.

Concepts: 17, 21, 11 | Sources: F06, F12, S04 | [Case report](#)

Facilitate the shared calculations

New fictional exercises / give learners the workbook before the answer key.

Exercise / suggested time	Demonstration and debrief
OEE / 15 min	Assign one factor to each group. Reconcile A/P/Q with productive minutes. Ask which event evidence is needed before blaming a machine condition.
Yamazumi / 20 min	Cut or mark the ten element IDs. Move only E4 and preserve 210 seconds. Ask what would make the transfer infeasible despite the improved bars.
Min-max / 10 min	Put usable on-hand, on-order and backlog on separate cards. Apply the declared trigger. Ask why ordering 36 double-counts expected arrivals.
Heijunka / 15 min	Place A/B packs into five pitch slots, then expand to ten repeats. Check demand mix, units and 400-minute boundary.
Office transfer / 15 min	Use six tokens and three role players. Compare batch and one-request transfer. Count person-minutes separately from elapsed minutes.

Ask for the assumption before the answer. A correct number with an inconsistent boundary is not a correct method.

Use the answer key to diagnose errors: unit conversion, denominator changes, double-counted inventory, forgotten element time, or confusing overlap with removed work.

Assess, coach and follow through

A formative review of learning; this is not certification or proof of workplace competence.

Dimension	Evidence of useful learning
Purpose	Explains when this method fits the problem and when it does not.
Method	Traces the sequence, branches and feedback without skipping the evidence gate.
Evidence	Separates observation, hypothesis, goal and result; uses consistent units and denominators.
Decision	Chooses a response and names what further evidence could change it.
Transfer	Defines a bounded application, owner, check and review point in local work.

For each dimension, record: ready to try with local support / needs coached practice / not yet demonstrated. Give one concrete piece of feedback and a next practice. Do not infer machine authorization, clinical competence or regulatory compliance from this training.

Management link: ask at the next review what was tried, what was observed, what failed, how the team responded and what they will change next. A problem that exceeds the local routine should enter a bounded A3, 8D or DMAIC investigation.

Method sources and further reading

References 1-18 of 36

Q01 ASQ - Plan-Do-Check-Act Cycle

Q02 The Deming Institute - PDSA Cycle

Q03 Institute for Healthcare Improvement - Model for Improvement

Q04 Lean Enterprise Institute - A3 Report

Q05 ASQ - Eight Disciplines 8D

Q06 ASQ - DMAIC

Q07 Lean Enterprise Institute - Gemba

Q08 Lean Enterprise Institute - Reinforcing Lean Behavior Through Visual Management

Q09 Lean Enterprise Institute - Jidoka

Q10 ASQ - Fishbone Diagram

Q11 ASQ - Handbook of Corrective and Preventive Action, Sample

F01 Lean Enterprise Institute - Total Productive Maintenance

F02 Japan Institute of Plant Maintenance - 2023 TPM Award Outline, autonomous maintenance example

F03 NIST - Asset Condition Management: A Framework for Smart, Health-Ready Manufacturing Systems

F04 Tennessee Manufacturing Extension Partnership - OEE Implementation Guide

F05 Toyota Motor Corporation - Toyota Production System

F06 Lean Enterprise Institute - First In, First Out (FIFO)

F07 Lean Enterprise Institute - Value Stream Mapping

Original OPEX instructional designs informed by these sources. The fictional datasets and lesson timings are authored teaching choices, not recommendations quoted from source organizations.

Method sources and further reading

References 19-36 of 36

- F08** Lean Enterprise Institute - Practicing Lean Fundamentals in an Office Environment
- F09** NIST - Lean Manufacturing: Don't Leave Home Without It!
- F10** Lean Enterprise Institute - Standardized Work
- F11** Lean Enterprise Institute - Operator Balance Chart
- F12** Lean Enterprise Institute - Single Minute Exchange of Die
- F13** Lean Enterprise Institute - Takt Time
- F14** Lean Enterprise Institute - Heijunka
- F15** NIST - Research Suggests Significant Benefits to Investing in Advanced Machinery Maintenance
- F16** US Environmental Protection Agency - Lean & Environment Toolkit, Chapter 5: 6S
- F17** Lean Enterprise Institute - Pull Production
- F18** ASQ - Quality Glossary: Overall Equipment Effectiveness
- F19** Lean Enterprise Institute - Heijunka Box
- F20** Lean Enterprise Institute - Inventory
- S01** LEI: Lean Thinking and Practice
- S02** CDC: Quality Training Standards
- S03** ASQ: Control Chart
- S04** OSHA: Control of Hazardous Energy
- S05** OpenAI: GPT-Image-2.5 Flare

Original OPEX instructional designs informed by these sources. The fictional datasets and lesson timings are authored teaching choices, not recommendations quoted from source organizations.

TPS: people, quality and synchronized flow

Trace an order across departments, connect quality response to demand-paced flow, and choose an improvement that can be checked at the customer boundary.



The faster machine did not improve delivery

Fictional training case: Willow Valves promises 80 verified valve sets today. Machining celebrates 110 bodies, but assembly ships only 68 sets. Team leader Imani walks one order from release through inspection and assembly with operators. These supplied facts describe a teaching day; they do not establish long-term capability.

Your role and the reference condition

Value-stream leader working with machining, quality and assembly representatives.

Normal: The system provides the required verified sets at the promised time without overburdening people or producing unwanted stock.

Gap: Machine output rose while the required sets remained incomplete. Staff were encouraged to keep cutting even when the correct components were unavailable.

Work within these conditions

1. A set needs a verified body and its matching seal kit.
2. Quality and safe work remain necessary conditions; the illustration is not an authorization to change equipment.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Case sheet, order tokens and two colored arrow pens
2. Blank end-to-end record; answer kept separate

Minutes	Activity and coaching prompt
4	Define the system outcome Why can 110 bodies coexist with 68 shipped sets?
8	Trace one order in pairs Which missing link prevents completion, and who can respond?
8	Run the office variant What would an extra drafting shift actually change?
5	Challenge the trial Which result would make you stop or adapt it?

Debrief

1. Ask whether the held-body and seal-kit problems are independent.
2. Invite an operator perspective before accepting a management target.

Individual or remote practice

Trace the order aloud and write the customer-level prediction before checking the answer.

Muda, mura and muri reinforce each other

Use daily release and workload evidence to explain how unevenness can produce overburden and waste, then design a test without assuming that all quiet time is removable.



Friday is overloaded before the work begins

Fictional training case: a service coordinator receives 20 complete requests each weekday. An internal manager releases work to the processing team in one large Friday bundle. Analyst Luis asks whether overtime reflects customer demand, the release rule or a lack of capacity.

Your role and the reference condition

Service team leader and request-release owner.

Normal: The team works at a sustainable pace and completes accepted requests accurately within the service promise.

Gap: The weekly total looks manageable, but a Friday surge produces repeated clarification calls and rushed corrections.

Work within these conditions

1. Use the supplied daily sustainable processing capacity of 25 requests.
2. This first-pass calculation ignores carry-in backlog and variation; verify both before implementing a release change.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Five day cards and 60 request counters
2. Release/arrival chart and queue worksheet

Minutes	Activity and coaching prompt
4	Compare the two patterns What does the weekly total hide?
7	Build the Friday queue Which assumption makes the 75-request remainder valid?
9	Calculate the warranty variant Where does Thursday begin: zero or Wednesday's remainder?
5	Plan transfer What evidence would identify real demand variation?

Debrief

1. Challenge claims that the team simply needs to work faster.
2. Discuss necessary response capacity before eliminating apparent quiet time.

Individual or remote practice

Use a separate row for arrivals, release, completion and queue; explain each change before viewing the solution.

Takt, cycle time and lead time are different

Calculate takt from net time and demand, distinguish it from observed cycle and lead time, and label missing measurements instead of inventing performance.



Three clocks, three decisions

Fictional assembly planning case: a team has 400 net available minutes and demand for 300 units. Supervisor Bea is asked whether the line is fast enough and whether a customer order can be promised tomorrow. The supplied concept gives no measured cycle time or order lead time.

Your role and the reference condition

Assembly supervisor with the planner and an operator observer.

Normal: Time measures carry a defined start, finish, unit and operating condition before they are compared.

Gap: A planning sheet copies the demand-derived 80 seconds into the actual cycle and order lead-time boxes.

Work within these conditions

1. 400 minutes is declared net production time; do not subtract planned breaks a second time.
2. No observed cycle-time or order lead-time value is present in this worked case.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Calculator and timing-definition sheet
2. Timestamp cards; no stopwatch needed for this desk exercise

Minutes	Activity and coaching prompt
4	Name the clocks Which value can be calculated from the supplied original inputs?
7	Complete the original record Why must two boxes remain unmeasured?
9	Work the changed case Does 88 below 90 settle the capacity question?
5	Plan real observation Which event boundaries and conditions will you record?

Debrief

1. Ask learners to distinguish calendar and working time.
2. Use the gross-time exception to expose double subtraction or missing deductions.

Individual or remote practice

Calculate independently, then explain each result as one sentence containing its unit and boundary.

Batch transfer versus one-piece flow

Construct the two transfer schedules, calculate first and final completion, and explain why lower elapsed lead time does not mean reduced person-work.



The packet waits for the other five

Fictional service simulation: six complete requests R1-R6 are ready at time zero. Three dedicated workers each perform a different two-minute step. Coordinator Anika compares moving the entire six-request batch after each step with transferring each request immediately when its step is done.

Your role and the reference condition

Service improvement facilitator and the three participating workers.

Normal: Every request receives all three steps in order; no worker performs two tasks simultaneously.

Gap: The batch rule delays downstream work even when the first request is ready.

Work within these conditions

1. No setup, travel, variability or rework is included.
2. Each stage has its own worker; this is not a one-person staffing model.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Six request tokens and three worker lanes
2. Timer or a printed minute grid; separate answer

Minutes	Activity and coaching prompt
4	Declare the rules What must remain identical in the comparison?
8	Move the six tokens Where is R1 waiting although its own task is finished?
9	Build the four-request variant Which tasks happen at the same time on different lanes?
4	Debrief transfer Which omitted real-world condition could change the result?

Debrief

1. Ask a learner to account for every person-minute.
2. Contrast necessary processing batches with a convenient transfer rule.

Individual or remote practice

Draw both schedules to scale and audit each worker lane for overlap before reading the answer.

Production and withdrawal kanban

Trace a container and its two authorizations, reconcile the replenishment quantity, and respond to a quality hold without inventing another signal.



One request, two different permissions

Fictional training case: Alder Components supplies bracket B17 from a supermarket to assembly cell C2. At 09:10 the cell starts a 12-piece container and returns withdrawal card W04. Material handler Maya must collect the next container. This exercise follows one transaction, not the sizing of the whole system.

Your role and the reference condition

Material handler, supported by the producing-process leader and quality owner.

Normal: Each eligible full container holds 12 verified B17 brackets. Item, quantity, source, destination and card identity agree. A withdrawal signal permits a move; the released production signal permits its replacement.

Gap: A supervisor suggests making three extra containers while the producer has spare time. One stock container also has uncertain quality status. Neither fact grants another production authorization.

Work within these conditions

1. The example uses a simple one-card-per-container arrangement with a defined card exchange point.
2. Quality status must be verified before conveyance; card count is controlled by the process owner.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Printed case and blank trace
2. Two differently marked card types and three container tokens
3. Answer held back until pairs complete practice

Minutes	Activity and coaching prompt
4	Frame the decision What evidence would let Maya move a container?
7	Demonstrate the exchange using tokens Which object travels downstream and which instruction returns?
9	Pairs complete practice and hold variant Account for every card, including the copy.
5	Debrief and transfer Which shortcut creates an unrecorded authorization?

Debrief

1. Ask a learner to defend a different valid container allocation.
2. If a learner counts 24 clips, identify the duplicate before correcting the arithmetic.

Individual or remote practice

Draw material and information in different line styles; explain each permission aloud before opening the answer.

Office pull: capacity, blocked work and aging

Count blocked work inside the declared active limit, choose the next action from capacity and age evidence, and retain explicit control of urgent exceptions.



A blocked request still occupies the system

Fictional administrative team: the agreed active-work limit is three requests, including blocked work. R1 and R2 are progressing, R3 awaits a required approval, and complete request R4 is ready to start. Coordinator Devon is asked to move R3 off the board so R4 can be admitted.

Your role and the reference condition

Office team coordinator with the approval owner.

Normal: Ready work is pulled when capacity is available; the team sees all accepted active work, its age and its blockers.

Gap: Moving the blocked card to an uncounted list would make the board appear to have capacity that the agreed rule does not provide.

Work within these conditions

1. The limit of three is a local teaching policy, not a universal recommendation.
2. Blocked means accepted but unable to progress; it does not mean completed or canceled.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Request cards and a three-slot board
2. Separate Ready area and blocker-response log

Minutes	Activity and coaching prompt
4	Define the active boundary Does changing a card's location change its commitment?
7	Work the three-slot case What can the team do before starting R4?
9	Run the four-slot and urgency variants Which evidence legitimately creates a slot?
5	Transfer the rule Who owns a blocker outside this team?

Debrief

1. Ask learners to describe an explicit exception without making it the normal route.
2. Check whether age is measured consistently and used without blaming the assignee.

Individual or remote practice

Count every accepted request on paper, then narrate the admission event and the unresolved blocker.

Heijunka mix and pitch release

Build and reconcile a leveled mix pattern from demand and pack size, while distinguishing a mathematically balanced release plan from a feasible production method.



A release box is a plan, not proof of capability

Fictional A/B line: 400 net minutes must serve demand for 180 A and 120 B. Each authorized pack holds six units. Planner Celia proposes the repeating pattern A, A, B, A, B and asks the team to check its quantities, timing and operating assumptions.

Your role and the reference condition

Production planner with operators, quality and changeover owner.

Normal: The release pattern represents wanted mix within the available period, with feasible capacity and quality controls.

Gap: A neat sequence can conceal infeasible changeovers or obsolete demand.

Work within these conditions

1. Takt is 80 seconds per required unit.
2. No measured changeover or cycle capability is supplied; the release plan remains a teaching proposal.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Two colors of blank pack tokens and a pitch grid
2. Calculator; separate changed-demand card

Minutes	Activity and coaching prompt
4	Translate demand to packs Which units belong on the release interval?
7	Fill one five-slot pattern Where do 18 A and 12 B come from?
9	Solve the A/B/B variant Can both mix and time be reconciled?
5	Challenge feasibility What could make a correct calculation impossible to run?

Debrief

1. Ask what changes when mix changes but total demand does not.
2. Distinguish leveling from suppressing a quality signal.

Individual or remote practice

Build one repeat first, then multiply and audit the total against each input.

Connect processes: flow, bounded FIFO or supermarket

Select a provisional connection between processes from identity, sequence and replenishment evidence, and specify what happens when the connection is full or blocked.



Three handoffs need three different controls

Fictional mixed-products workshop: planner Omar reviews adjacent assembly and test, a custom-nameplate queue before curing, and repeat fasteners supplied to several benches. Management proposes putting every item into the same open storage rack.

Your role and the reference condition

Material-flow designer with operators from both sides of each handoff.

Normal: The connection preserves identity, appropriate sequence and response to demand without uncontrolled accumulation.

Gap: A generic rack does not say which item moves next, how much may wait or what authorizes replenishment.

Work within these conditions

1. Direct flow requires feasible process, safety and quality conditions.
2. A bounded FIFO preserves its agreed sequence; a supermarket uses controlled stock and replenishment, not unlimited storage.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Three route cards, four queue tokens and a blank decision tree
2. An optional quality-hold card

Minutes	Activity and coaching prompt
4	Identify the handoff differences Which fact makes a custom item different from a repeat fastener?
8	Choose three controls What must be known before calling a shelf a supermarket?
8	Introduce the full/held lane Who may change sequence or release?
5	Apply to repair Which observation would reverse your provisional choice?

Debrief

1. Accept reasoned alternatives when their rules and conditions are explicit.
2. Reject solutions that simply move overflow out of view.

Individual or remote practice

Draw one evidence-to-choice branch for each route and audit the exception before opening the answer.

Standardized work: sequence, takt and standard

WIP

Read a standardized-work route with its takt, sequence and standard in-process stock, then identify what must change when the physical route or stock position changes.



The route is more than four instructions

Fictional bench case: operator Mara collects a verified kit, performs the task, checks output and hands off before returning to the kit point. The supplied teaching layout has takt 80 seconds per required unit and two standard in-process units: one at Work and one at Handoff. No observed cycle time is supplied.

Your role and the reference condition

Operator and team leader reviewing the current method together.

Normal: The displayed chart matches the agreed route, material positions, quality checks and operating basis.

Gap: A replacement poster lists the four verbs but omits the return route and stock locations.

Work within these conditions

1. Two units and the layout are illustrative settings, not validated operating requirements.
2. A posted chart does not replace approved quality, safety or training instructions.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Plan-view sheet and movable station/stock symbols
2. Separate quality-check and return-arrow symbols

Minutes	Activity and coaching prompt
4	Walk the drawing with a finger Where does the operator return after handoff?
8	Audit stock and clocks Which value is a requirement and which is missing observation?
8	Repair the second-cell draft What can you correct without inventing a time?
5	Plan a controlled revision How will you know the drawing matches the taught work?

Debrief

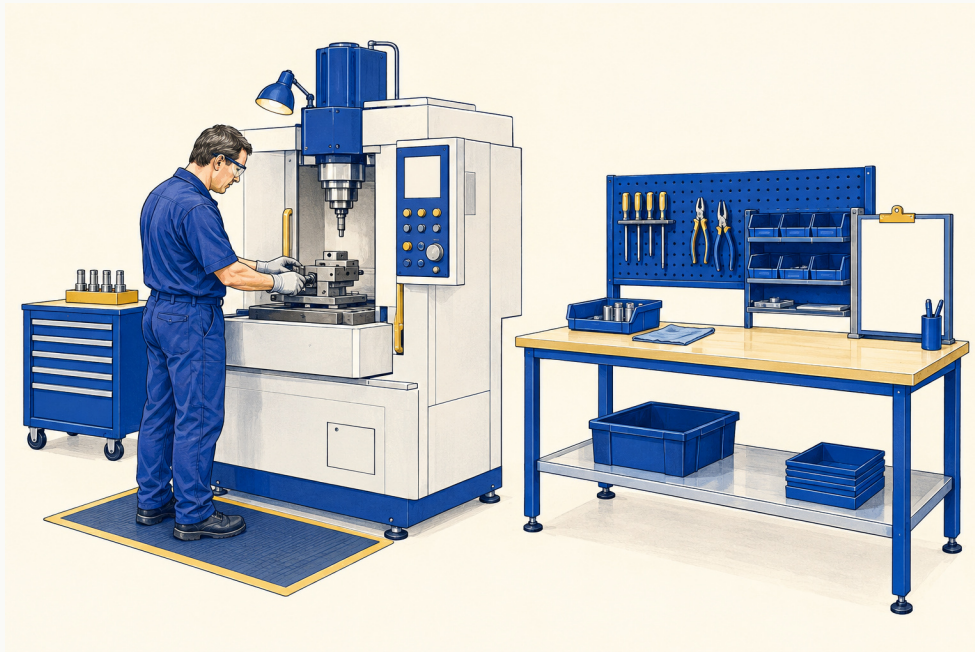
1. Ask why two stock symbols cannot stand for three units without an explicit legend.
2. Retain the check step when participants seek a shorter route.

Individual or remote practice

Trace a full cycle, then reconcile each stock symbol and timing field with the stated setting.

Manual, walking and machine time

Plot manual work, automatic time and waiting on one timeline, reconcile elapsed and work-content totals, and test whether a proposed overlap is actually permitted.



Thirty automatic seconds are not thirty extra labor seconds

Fictional machine-and-bench case: loading takes 10 seconds, the automatic cycle then runs for 30 seconds, a separate manual task takes 20 seconds during that cycle, and unloading takes 10 seconds after it ends. Analyst Theo must explain the supplied 50-second arrangement without double-counting overlap.

Your role and the reference condition

Process analyst observing with the operator and equipment owner.

Normal: No person or machine is assigned incompatible simultaneous work, and access, precedence and quality conditions are respected.

Gap: The draft estimate adds 40 manual seconds and 30 automatic seconds and calls the result a 70-second observed cycle.

Work within these conditions

1. The overlap is hypothetical and permitted only for this teaching calculation.
2. Task availability, machine access, walking and repeat-cycle feasibility require real verification.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Timeline grid and separate operator/machine markers
2. Original and longer-task cards

Minutes	Activity and coaching prompt
4	Declare the lanes Who is doing each activity?
8	Build the 50-second sequence Where are the 20 seconds counted in both lanes?
8	Solve the changed model When can unloading actually begin?
5	Review reality checks Which condition cannot be proven by arithmetic?

Debrief

1. Ask why the longer task creates machine rather than operator waiting.
2. Do not accept a 70-second elapsed label for the supplied model.

Individual or remote practice

Draw the lanes to scale and check every shared-resource overlap before consulting the answer.

Yamazumi: movable elements and constraints

Build and interpret work-element stacks, propose a feasible ownership change, and distinguish a balanced work-content chart from verified cycle performance.



Move an element, then test the real work

Fictional window-preparation teaching case: three trained operators share ten named elements. The team has 400 net available minutes and demand for 300 units. The supplied element times describe human work content for one unit, not observations proving sustained throughput.

Your role and the reference condition

Team leader facilitating a trial with the three operators and process engineer.

Normal: A proposed sequence must meet demand while retaining quality checks, safe access and the required precedence.

Gap: Operator 1 has 85 seconds of assigned work against 80-second takt; operators 2 and 3 have 65 and 60 seconds.

Work within these conditions

1. Only E4, return empty tote, is provisionally transferable from operator 1 to 2.
2. Walking, machine overlap, competence, access and variation need confirmation before adopting the proposal.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Ten E1-E10 element strips proportional to supplied times
2. 80-second and 75-second takt references
3. Blank allocation and trial record; calculator

Minutes	Activity and coaching prompt
5	Define units and demand What does this vertical axis measure?
8	Demonstrate E4 transfer Which work disappeared? None: reconcile 210.
10	Individual calculations, then pair challenge Does zero nominal margin prove the new demand is feasible?
7	Debrief constraints and trial What observation could invalidate your neat bars?

Debrief

1. If totals change in the paper proposal, inspect element identity before recalculating.
2. Separate a planning hypothesis from a measured standard and a staffing decision.

Individual or remote practice

Draw stacks on a shared scale, complete the changed-demand problem, then compare reasoning with the answer.

SMED: externalize safely, verify first good output

Separate work that genuinely requires a stopped process from preparation that can occur externally, and preserve first-good-output verification when proposing a changeover trial.



Fetch the kit before the stop, if it is truly ready

Fictional packaging changeover: the team currently stops, fetches an approved kit, performs the controlled internal change and verifies first good output. Leader Nina proposes preparing the approved kit while the preceding run is still operating. No step durations or achieved reduction are supplied.

Your role and the reference condition

Changeover team with equipment, quality and operating representatives.

Normal: The next configuration is correct, safe and producing accepted output before the changeover is considered complete.

Gap: The machine is stopped while the approved kit is located, but nobody has confirmed which preparation can safely occur during production.

Work within these conditions

1. Internal work requires the process stopped; external preparation can occur while it operates only under approved conditions.

2. No target time justifies bypassing isolation, safeguards or acceptance checks.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Before/proposed sequence cards and a readiness checklist
2. A missing-kit exception card

Minutes	Activity and coaching prompt
4	Define completion Does the clock stop before or after acceptance?
8	Classify the original steps What evidence makes preparation genuinely external?
8	Repair the printing proposal Which shortcut changes quality authority?
5	Plan measurement How will you compare unlike changeovers honestly?

Debrief

1. Challenge unsupported savings figures.
2. Use the incomplete kit to discuss early visibility rather than blame.

Individual or remote practice

Write the two sequences and annotate approval, readiness and acceptance conditions before reading the solution.

Replenishment stock: lead time and uncertainty

Reconcile usable stock and replenishment events, identify lead-time uncertainty, and assemble the evidence needed before approving a stock policy.



Shelf space did not determine the refill delay

Fictional staff pantry: storekeeper Jo has repeated paper-cup shortages despite a marked shelf. The shelf limit was chosen because four boxes fit. Jo follows three replenishment cycles to distinguish usable stock, orders in transit and actual refill delay. This extends a conceptual stock envelope; it does not supply an approved safety-stock formula.

Your role and the reference condition

Inventory owner with purchasing and the people consuming the item.

Normal: The controlled stock and replenishment rule support the agreed service need without excessive aged stock or unsuitable handling.

Gap: Physical capacity has been mistaken for evidence of required inventory.

Work within these conditions

1. Cup counts, box counts and timestamps must use consistent units.
2. The small supplied sample is not sufficient to set a service-level guarantee or final stock parameters.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Stock-status tokens and a signal-to-receipt timeline
2. Paired observation table and missing-input checklist

Minutes	Activity and coaching prompt
4	Reconcile the shelf Which cups could a user take now?
8	Trace replenishment clocks When does an incoming cup actually become available?
8	Review the sachet variant Why is the largest observed consumption not the complete answer?
5	Plan data collection What service decision must the owner make?

Debrief

1. Distinguish physical storage capacity from a replenishment rule.
2. Ask learners to identify a record error that more stock would conceal.

Individual or remote practice

Reconcile statuses first, then connect each consumption count to its own delay interval.

PFEP to point-of-use replenishment

Reconcile part identity and packaging data with a real replenishment route, then control the impact of a pack-size change before using it in supply instructions.



The database says twenty; the box holds sixteen

Fictional bracket-supply route: part P42 is consumed at bench B in packs defined as 20 pieces in its part record. Handler Eva finds supplier boxes containing 16. The route replenishes by box count, so the discrepancy changes what the bench receives.

Your role and the reference condition

Material-flow owner with handler, purchasing and the point-of-use operator.

Normal: Part identity, packaging quantity, location and handling data agree with the actual route and approved supply method.

Gap: The route card asks for three boxes, assumed to be 60 pieces, while the new boxes supply only 48.

Work within these conditions

1. The supplied packaging counts are fictional; verify identity before counting or changing records.
2. No handling weight or approved load limit is supplied, so the case does not authorize a new lifting or transport method.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Part record, supplier package card and route card
2. Piece counters for old and new packs

Minutes	Activity and coaching prompt
4	Establish identity Could this be a wrong part instead of a pack change?
8	Reconcile three boxes What does the bench actually receive?
8	Work the fastener variant What does each rounding choice imply?
5	Define closure Which physical event proves the records agree?

Debrief

1. Require an approval source for the pack change.
2. Ask where an old quantity could persist after the database is corrected.

Individual or remote practice

Translate every package quantity into pieces, then audit the dependent instructions.

Jidoka and andon: detect, respond, verify restart

Connect an abnormality signal to containment, response ownership and verified restart, distinguishing signal reset from evidence that the process is ready.



The light is off, but the condition remains

Fictional assembly cell: operator Leon sees an incomplete fastening confirmation on unit V18 and raises the approved help signal. A colleague clears the display and proposes restarting because the light is no longer on. The response card requires confirmation of the fastening result and controlled review of potentially affected units.

Your role and the reference condition

Operator, team leader and authorized quality/equipment responder.

Normal: An abnormality receives a timely response; unsuitable output does not proceed, and restart follows the approved acceptance conditions.

Gap: Clearing a display has been confused with correcting and verifying the underlying condition.

Work within these conditions

1. Use the site's actual approved stop/help procedure. A process andon is not a substitute for emergency response.
2. This exercise gives no equipment setting, isolation sequence or authority to override safeguards.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Unit identity cards and response-state tokens
2. Approved-procedure placeholder rather than invented technical instructions

Minutes	Activity and coaching prompt
4	Read the abnormality What was observed, and what is only a guess?
8	Set the review boundary Why start with V16 rather than only V18?
8	Work the labeling variant What does resetting the light establish?
5	Close the response What should the operator hear back?

Debrief

1. Challenge pressure to treat the target as restart authority.
2. Distinguish a normal process help signal from emergency procedures.

Individual or remote practice

Write separate detect, contain, respond, verify and learn records; do not merge them into a single "fixed" box.

Poka-yoke: prevention versus detection

Distinguish preventing a defined error from detecting it before escape, and build a challenge-test record that checks both the control and its failure response.



A keyed part and a warning light solve different problems

Fictional connector assembly: the original connector can be inserted backward. Proposal A introduces a keyed geometry that should prevent that orientation. Proposal B uses a sensor to detect a backward insertion and block release. Engineer Sana must compare mechanisms rather than label both "mistake-proof" without testing.

Your role and the reference condition

Process engineer with operator, quality and design representatives.

Normal: The defined wrong orientation cannot reach accepted downstream output under the approved method.

Gap: The team has only tested correctly oriented parts and claims the wrong-orientation failure is eliminated.

Work within these conditions

1. This is a desk comparison, not an instruction to bypass or modify production equipment.
2. The control addresses a specific error mode; other wrong, missing or damaged parts require their own analysis.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Two design proposal cards and a blank challenge matrix
2. Approved test-object placeholder; no live-machine challenge in class

Minutes	Activity and coaching prompt
4	Define the error Which orientation and which connector are in scope?
8	Compare mechanisms Where does each proposal interrupt the error path?
8	Test the washer reasoning What does a warning allow to happen next?
5	Plan maintenance What change would require revalidation?

Debrief

1. Ask learners to identify a different failure mode outside each claim.
2. Do not reward a stronger prevention label without challenge evidence.

Individual or remote practice

Draw the error path, mark where the control acts and complete expected outcomes before reading the answer.

5 Whys with evidence and alternative branches

Build a causal explanation with evidence at each link, retain a competing explanation and define a test whose result could change the decision.



The missing attachment is an event, not an attitude

Fictional service team: three change-request packets arrived without a required drawing. Reviewer Sol is asked to finish a five-whys form that already ends with staff not paying attention. The team can inspect packet histories and reproduce submission in a training environment.

Your role and the reference condition

Process owner and frontline colleague investigating the specific omission.

Normal: Every submitted change packet includes the applicable drawing or an explicit approved exception.

Gap: Three recorded omissions; no evidence yet connects them to attention.

Work within these conditions

1. Use synthetic test packets; do not alter live customer requests.
2. A plausible chain is a hypothesis until its links are supported; five is not a mandatory stopping count.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Event and hypothesis cards
2. Blank cause-test record
3. Synthetic packet example

Minutes	Activity and coaching prompt
5	Separate facts and labels Which claim could another observer verify?
7	Build competing test plans What result differs between A and B?
8	Practice acknowledgment case What would disprove your explanation?
5	Debrief branches Must there be one cause?

Debrief

1. Ask for a mechanism when a learner names attitude.
2. Do not reward chain length over tested reasoning.

Individual or remote practice

Write the competing prediction before imagining any result, then check the suggested reasoning.

Choose a problem-solving approach

Use a known standard, observed gap and learning need to choose an initial problem-solving route, while separating immediate restoration from recurrence investigation.



A restart closes the outage, not the recurring problem

Fictional service-desk case: Harbor Support processes customer change requests. Every Monday the routing service stops sending acknowledgments. A documented restart restores routing. The duty lead has marked four weekly incidents complete after restarting, but the same failure has returned. A separate improvement request asks for faster handling of routine changes.

Your role and the reference condition

Duty lead deciding the immediate response and process owner assigning subsequent learning.

Normal: The current service standard is acknowledgment within one working hour. The restoration procedure returns the service to that condition.

Gap: Four Monday incidents breach the standard; the reason for recurrence has not been established.

Work within these conditions

1. Restore the active service through its authorized procedure before conducting a prolonged study.
2. Classification selects the learning need; it does not prove a cause or prescribe a particular form for every issue.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Four worked-case cards
2. Practice cards with the final ambiguity concealed until discussion
3. Blank routing/handoff record

Minutes	Activity and coaching prompt
4	Frame restoration versus learning What closes an outage? What prevents its return?
7	Demonstrate four routes Which case lacks a current service standard?
9	Classify changed cases in pairs What fact supports your category?
5	Reveal ambiguity and debrief What evidence would make you change your answer?

Debrief

1. Coach a category-only answer by asking for the current reference and next evidence.
2. Accept different initial routes if the learner states defensible assumptions and customer response.

Individual or remote practice

Write your assumptions before naming a route, then compare your reasoning rather than only the category label.

From broad complaint to a testable problem

Convert counts into comparable rates, define a focused problem and choose the next breakdown without treating a difference as proof of cause.



The smaller error count hides the larger rate

Fictional request-processing review: team A reports 20 errors in 1,000 cases; team B reports 10 in 100. Manager Elif initially assigns all improvement attention to A because its error count is larger. The shared error definition and case mix still need checking.

Your role and the reference condition

Process analyst with both team representatives.

Normal: Counts and denominators refer to the same period and definition; comparisons state their scope.

Gap: Raw counts suggest one priority while rates suggest another.

Work within these conditions

1. Treat each count as cases with at least one defined error for this exercise, not unrestricted defects per case.
2. Different case mix, detection or periods can invalidate a direct team comparison.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Count/denominator cards
2. Blank comparison sheet
3. Calculator

Minutes	Activity and coaching prompt
4	Show counts before denominators What changes when volume is revealed?
7	Calculate and reconcile Why is the combined rate not 6%?
8	Practice equal-rate case What claim can you support?
5	Choose next breakdown Which question will the new category answer?

Debrief

1. Check definitions before correcting arithmetic.
2. Ask what would make a comparison unfair.

Individual or remote practice

Calculate the combined rate from summed counts, then write one cautious problem statement.

Gemba: observe work, ask, follow through

Distinguish an observed work condition from an interpretation, ask a respectful question that improves understanding and close a support commitment at the work.



The handwritten note has a purpose

Fictional packing area: leader Ben sees operator Asha using a handwritten note beside the approved order screen. Earlier visits criticized unofficial paper, so colleagues are reluctant to describe workarounds. Ben wants to understand the handoff before deciding whether the note is a problem.

Your role and the reference condition

Leader visiting with the colleague who performs the work.

Normal: The approved process supplies the information needed to identify the order and complete the handoff correctly.

Gap: The note appears to supply information missing at the moment of work, but its purpose and accuracy are not yet known.

Work within these conditions

1. Respect local access, privacy and operating rules; use only fictional order records in this exercise.
2. Observation is not permission to bypass the current method or remove a control before understanding its function.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Annotated fictional packing scene
2. Observation versus inference cards
3. Blank support record

Minutes	Activity and coaching prompt
4	Notice without judging What can you actually see?
7	Role-play inquiry What purpose does the note serve?
8	Practice office transfer What remains unknown about the spreadsheet?
5	Plan return visit What evidence would make support complete?

Debrief

1. Replace why do you ignore the system with a question about the work decision.
2. Ask what the leader owes the colleague after the visit.

Individual or remote practice

Write an observation and a competing interpretation in different columns before drafting the conversation.

Leader standard work supports problem solvers

Run an observable leader routine that develops the issue owner, removes a support barrier and verifies an overdue commitment instead of merely completing calendar checks.



A completed walk, an unfinished commitment

Fictional assembly-team case: supervisor Imani visits every work area each morning but personally supplies answers and fixes missing materials. Team member Leo waits for her instructions. Yesterday he agreed to test a clearer kit-ready signal; the board now marks the action done, although a kit again arrived without its readiness check.

Your role and the reference condition

Supervisor coaching the team owner, with a materials manager available to resolve a cross-team barrier. Normal: The leader routine connects actual work, response, coaching and verification. Team ownership survives the conversation; leaders supply support that the owner cannot provide alone.

Gap: The calendar is complete and the action box is green, but no one has checked whether the change worked.

Work within these conditions

1. The leader responds to immediate safety, quality or delivery needs through the normal authority before coaching at length.
2. Times below are a fictional teaching rhythm, not a universal prescribed daily schedule.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. L17 commitment record
2. Two role cards for leader and owner
3. Practice handoff evidence; separate answer

Minutes	Activity and coaching prompt
4	Contrast activity with outcome What did the green box actually prove?
8	Role-play the worked conversation Ask a question that leaves Leo doing the thinking.
9	Pairs practise Mara's case What support belongs to the leader?
6	Debrief overdue response Was the test unsuccessful, or was it never performed?

Debrief

1. If the leader dictates a solution, replay the exchange using the owner's prediction and evidence.
2. If no support is offered, identify the cross-team authority the owner lacks.

Individual or remote practice

Write both sides of a short conversation, then highlight owner reasoning, leader support and verification separately.

Daily board: measure, respond, learn

Turn a plan-versus-actual gap into an owned response, use escalation when authority is missing and close only when the receiving team sees evidence.



The message was sent; the blocker remains

Fictional dispatch huddle: the team planned 24 ready orders by 09:00 and has 18. Four orders await missing labels and two await customer clarification. Yesterday's board marked a label issue escalated but the support response never returned.

Your role and the reference condition

Dispatch lead and named support owners for label service and customer clarification.

Normal: The board shows expected result, actual condition, priority gap, next owner and review evidence.

Gap: Six orders are not ready; a sent escalation is being treated as closure.

Work within these conditions

1. Ready means all defined checks complete, not merely packed.
2. Do not spend the whole huddle solving every cause; assign focused work and a return point.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Order tokens and response board
2. Blank plan/actual/action record
3. Partial-recovery card

Minutes	Activity and coaching prompt
4	Define ready What does the actual count include?
7	Run a short huddle Who accepted the label issue?
8	Practice partial recovery Which identities remain open?
5	Debrief closure What must come back from support?

Debrief

1. Ask learners to point to the evidence behind a green status.
2. Keep the huddle focused on response and review rather than debating every cause.

Individual or remote practice

Use tokens to update each verified case, then reconcile the board total.

Hoshin: align strategy through catchball

Translate a strategic direction into a feasible team contribution, expose a cross-functional tradeoff and return evidence that can revise the agreed means.



The target is shared; the proposed means conflict

Fictional equipment-services business: leaders want customers to receive confirmed repair dates sooner. Planning proposes daily small releases, while purchasing proposes larger less-frequent batches to reduce transaction effort. Both claim to support the strategy, but their resource and timing assumptions conflict.

Your role and the reference condition

Service director, planning owner and purchasing owner discussing contributions with frontline representatives.

Normal: A small set of priorities links purpose, current gap, proposed means, capacity and review evidence.

Gap: Departments repeat the same strategic slogan while committing to incompatible operating patterns.

Work within these conditions

1. The exercise teaches alignment dialogue, not a complete strategy or a mandatory X-matrix.
2. A target is not evidence that the organization has capacity or a feasible method to achieve it.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Director/planning/purchasing role cards
2. Blank contribution agreement
3. Competing schedule cards

Minutes	Activity and coaching prompt
5	Frame strategic purpose What would make faster confirmation worse for the customer?
8	Conduct catchball dialogue What work or capacity supports your promise?
9	Practice shared-specialist case Who can authorize the tradeoff?
5	Debrief learning return What evidence would make leadership revise the means?

Debrief

1. If the answer repeats the target, request an operating proposal and resource assumption.
2. Accept alternative trials with explicit scope and countermeasures for displaced work.

Individual or remote practice

Write the contribution, then challenge it from the other department's perspective before revising.

Improvement and coaching kata

Define a near-term operating condition, test one obstacle with a prediction and use a failed prediction to choose the next experiment.



The reminder did not create an owner

Fictional service team: learner Jo is improving request intake with coach Eva. The challenge is fewer requests waiting without a responsible receiver. In a six-request observation, four had a named receiver at handoff and two did not. Jo's near-term target is that each request in the next agreed trial has a named receiver before leaving intake.

Your role and the reference condition

Improvement learner owning the experiment and coach supporting the reasoning.

Normal: The target describes the desired operating pattern and the next review horizon, not merely a distant performance number.

Gap: The receiving role is not always explicit at handoff.

Work within these conditions

1. Use a bounded fictional trial, not an unapproved change to a live service.
2. One small trial provides learning under its conditions; it does not establish permanent success.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Prediction/result cards
2. Blank experiment record
3. Learner/coach roles

Minutes	Activity and coaching prompt
5	Set operating target What should happen at each handoff?
7	Reveal failed prediction What changed in your understanding?
9	Practice due-date case How does your next test address the actual obstacle?
5	Debrief scope What does this small test not establish?

Debrief

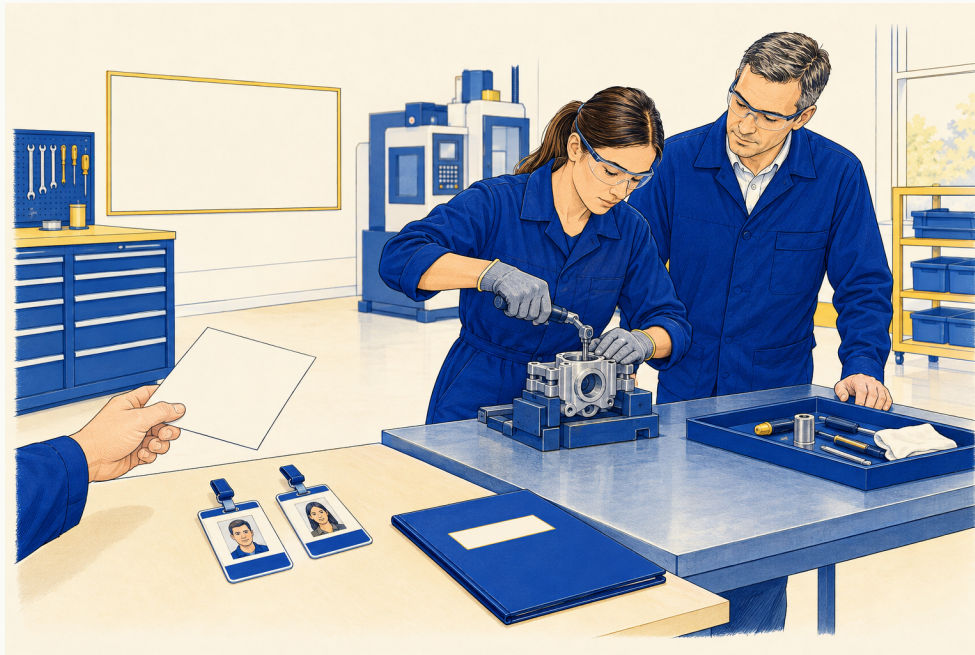
1. Ask for the learner's prediction before showing results.
2. Challenge a trial that excludes the very cases it should teach about.

Individual or remote practice

Cover the actual column, write a prediction, then compare and choose a next test before reading the answer.

Job instruction: steps, key points and reasons

Teach an approved repeatable task through important steps, key points and reasons, then assess the learner's demonstration and follow-up need.



A demonstration is more useful than an attendance tick

Fictional administration team: instructor Sana teaches new colleague Luis how to register a received change request in a training system. The approved task requires matching the request identity, recording the received time and assigning the authorized queue. A look-alike request number makes a deliberate identity check important.

Your role and the reference condition

Qualified instructor and learner using an approved method in a synthetic training environment.

Normal: The learner performs the task correctly and explains the key points and their reasons before support is reduced.

Gap: Luis watched the task once and signed attendance, but his first attempt selected the similar request number.

Work within these conditions

1. This is an original administrative example, not permission to change real request records.
2. Job instruction teaches an established approved method; unresolved process design must be addressed by its owner.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Synthetic request and look-alike record
2. Blank steps/key-points/reasons sheet
3. Instructor/learner roles

Minutes	Activity and coaching prompt
5	Prepare a focused breakdown Which detail prevents the important error?
8	Demonstrate and explain Why use the source receipt time?
9	Practice teaching document selection Can the learner explain the key point?
5	Plan follow-up What changed case would test transfer?

Debrief

1. If the breakdown is all clicks, ask for the critical judgment and reason.
2. If the instructor takes over, replay with the learner doing and explaining.

Individual or remote practice

Create a breakdown and record a spoken teach-back; use a changed example to check whether the reasons still guide action.

Shine and sustain: evidence over time

Distinguish a clean appearance from sustained condition control using dated observations, owned responses and a comparable later check.



Shine reveals; sustain verifies

Fictional workshop: the team photographs a cleaned saw-support area on Monday. A clean-to-inspect check reveals residue at the base. Tuesday's shift sees a new trace after the authorized response, and Friday's planned review must decide what the evidence actually supports. The photographs are training illustrations, not a completed workplace audit.

Your role and the reference condition

Area owner, shift colleagues and the technical owner for any equipment-related finding.

Normal: The agreed clean/ready reference is visible; routine checks expose deviations and assign response rather than hide them.

Gap: A glossy Monday after-photo is being used to claim the condition is permanently sustained.

Work within these conditions

1. Cleaning follows the approved method and access rules; technical work remains with its qualified owner.
2. A few checks can show evidence over time but cannot certify permanent control or safety.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Three-date condition storyboard
2. Blank history/verification sheet
3. Tool-status practice cards

Minutes	Activity and coaching prompt
4	Read the photo claim What does this one image establish?
7	Build the condition history What does Tuesday change?
8	Practice tool-station case Which response protects status clarity?
5	Debrief sustain evidence What would you need from another shift?

Debrief

1. Ask learners to distinguish cleaning completion from defect closure.
2. Reject invented future observations while accepting a clear verification plan.

Individual or remote practice

Write a caption for each observation stating what it does and does not support, then complete the transfer record.

Operator care and specialist maintenance

Complete a useful abnormality handover, keep operator and specialist responsibilities distinct, and verify a response under comparable conditions before closing the care loop.



Wiping the trace does not establish its source

Fictional teaching case: operator Nia performs the approved external condition check on press P4. The reference photograph shows the accessible base edge clean and dry. At the start of the shift she sees a new oil trace on the floor outside that edge. Earlier absorbent granules and wiping marks show that someone attempted cleanup, but there is no linked defect record.

Your role and the reference condition

Trained operator, team leader and qualified maintenance technician, each within the site-defined role.

Normal: The approved observation point is accessible, identified and compared with a current normal-condition reference. New deviations have a receiving owner and verification plan.

Gap: The floor has been cleaned before, but the source, current status and recurrence are unknown. A green cleaning tick is being mistaken for resolved equipment condition.

Work within these conditions

1. This lesson instructs observation and handover, not disassembly, adjustment, isolation or technical repair.
2. Immediate access control, spill response and operating decisions follow the site procedure and trained authority.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Illustrated normal/abnormal condition panel
2. Blank abnormality ticket
3. Role cards: operator, leader, qualified maintenance

Minutes	Activity and coaching prompt
5	Describe only visible facts Which words are observations and which are diagnoses?
7	Demonstrate the receiving handoff Who has accepted the next decision?
9	Complete U7 practice What evidence would challenge a closure claim?
6	Trace verification feedback What changes in tomorrow's check, and who approves it?

Debrief

1. Coach vague reports by asking for asset, point and normal reference.
2. If the learner repeats a warning only, ask them to complete the actual ticket and verification plan.

Individual or remote practice

Fill the ticket first, then assign each action to a role and draw the return from verification to the care routine.

Planned maintenance: criticality to verified return

Use repeat-failure and task evidence to challenge a maintenance plan, define authorized work and verify both return to service and later effectiveness.



Completed maintenance, recurring loss

Fictional packaging line: transfer unit M8 stops intermittently. A scheduled external clean/check was marked complete on day 1; similar interruptions were recorded on days 3 and 6. Planner Kira is asked to double the task frequency immediately. The failure mechanism and execution detail are not yet established.

Your role and the reference condition

Maintenance planner with the qualified technician, operator and asset owner.

Normal: A maintenance task has a justified purpose, required competence/resources and evidence that the required function was restored.

Gap: Task completion is recorded, but recurrence continues and the task's relationship to the failure is unclear.

Work within these conditions

1. This lesson plans evidence and responsibilities, not technical disassembly, adjustment or isolation steps.
2. Calendar frequency and condition thresholds require asset-specific technical authority; none is prescribed by this exercise.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. M8 event and task cards
2. Blank plan-review/work package
3. Separate immediate and later verification headings

Minutes	Activity and coaching prompt
5	Clarify required function Are these events actually the same failure?
7	Review task evidence Does the tick prove suitability or execution?
9	Practice Q5 plan review What evidence would justify changing the interval?
5	Debrief effectiveness What can a restart test not establish?

Debrief

1. If learners choose a repair, ask which supplied evidence justifies it.
2. If they only request more data, require a named question, owner and record.

Individual or remote practice

Write three competing explanations for recurrence and the evidence needed to distinguish them.

OEE loss waterfall with denominator discipline

Reconcile OEE factors and equivalent-time losses, retain first-pass quality accounting and choose a loss investigation without mistaking the percentage for a cause.



One percentage, three different loss questions

Fictional machine-shift record: 450 minutes were planned for production, the machine ran 360 minutes and made 600 units, of which 570 were first-pass good. The approved ideal cycle for this exercise is 0.5 minute per unit. Analyst Tessa must explain the loss picture before recommending improvement work.

Your role and the reference condition

Production analyst with operator, quality and maintenance representatives.

Normal: Time scope, count definitions and ideal cycle are explicit and consistent; the factors reconcile to good ideal time divided by planned time.

Gap: The dashboard shows a low result but the team is treating all lost time as downtime and counting reworked units as first-pass good.

Work within these conditions

1. Planned-production time and ideal cycle are supplied teaching inputs; real use requires a controlled definition.
2. Quality and performance losses below are ideal-time equivalents, not necessarily separately observed clock intervals.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Native 450 > 360 > 300 > 285 waterfall
2. Blank calculation sheet
3. Calculator; first-pass/rework tokens

Minutes	Activity and coaching prompt
5	Define denominators Which time is planned, run and ideal?
8	Reconcile the worked shift Where do the 15 quality-loss minutes come from?
10	Calculate changed shift Can both OEE paths agree?
5	Debrief recovery and action What event evidence is needed before choosing a repair?

Debrief

1. Check scope before correcting a formula.
2. Make the learner label equivalent time versus observed clock time.

Individual or remote practice

Calculate factors and direct good-ideal-time ratio independently, then use their agreement as a reconciliation check.

Quality maintenance: control conditions, not just inspect output

Link a product defect to a testable equipment-condition mechanism, maintain the approved condition and verify both the condition and affected output before claiming effectiveness.



A restored condition is only half the verification

Fictional assembly fixture F9 positions a component before a marking operation. Quality engineer Mei reviews repeated mark-location defects and a report that the locating face has residue. The team proposes cleaning the face and declaring the quality problem solved. Engineering controls the applicable fixture and product acceptance criteria.

Your role and the reference condition

Quality/process engineer with the qualified maintenance owner and trained operator.

Normal: The approved locating condition and product mark position are both defined, with checks appropriate to the process.

Gap: Residue and mark errors appear together, but the mechanism has not been demonstrated and other explanations remain.

Work within these conditions

1. This learning record does not supply technical tolerances or instructions for changing the fixture.
2. Correlation is a starting point; use authorized tests, suitable measurement and the actual engineering criteria.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Fixture/quality relationship illustration
2. Blank mechanism and dual-verification record
3. Condition-pass/product-fail exception card

Minutes	Activity and coaching prompt
5	Define both references What exactly must the fixture and product satisfy?
7	Trace the mechanism What could contradict residue causing the mark error?
9	Practice seal case Which decision is supported and which stays open?
5	Debrief maintenance linkage What evidence justifies adding a maintained condition?

Debrief

1. Ask for the physical/process link when the answer says dirty caused defects.
2. Do not discard a valid restoration record simply because the broader quality hypothesis failed.

Individual or remote practice

Draw the condition, mechanism and product as separate boxes; annotate evidence and alternatives before reading the answer.

TOC five focusing steps

Apply the five focusing steps to a stated system outcome, distinguish using existing capacity from adding capacity, and return to identification when the limiting condition moves.



Improving the old constraint can become inertia

Fictional pump route: customer demand is 90 accepted units per shift. Comparable effective capacities are cutting 110, finishing 70 and final test 85. Manager Priya initially identifies finishing as the limiting stage. A controlled improvement later demonstrates finishing at 95, while final test remains 85.

Your role and the reference condition

System owner coordinating the affected process leaders.

Normal: Improvement increases reliable system delivery while maintaining quality and other necessary conditions.

Gap: The team plans another finishing investment even after final test has become the lower-capacity stage.

Work within these conditions

1. Capacities are supplied fictional effective rates for the same mix and period.
2. A capacity comparison is a working hypothesis; observed starvation, blocking, quality and policy effects still need review.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Stage-capacity cards and a customer-demand card
2. Before/after change card and policy log

Minutes	Activity and coaching prompt
4	Define the goal What counts as accepted system output?
8	Choose the first actions Which actions use existing capacity and which add it?
8	Reveal the improved stage Why return to step one before buying more finishing capacity?
5	Apply the service variant Which local rule could undermine the new focus?

Debrief

1. Challenge a mandatory march through elevation.
2. Ask whether demand or an external policy changes the boundary of the hypothesis.

Individual or remote practice

Write the limiting comparison before and after, then connect each supporting rule to the current result.

Find the constraint: evidence, not the biggest queue

Use comparable demand and capacity evidence to form a constraint hypothesis, then test it against actual starvation, blocking, quality and release conditions.



The largest queue is a clue, not the conclusion

Fictional three-stage route: A, B and C have supplied comparable effective capacities of 12, 8 and 11 units per hour. Demand is 10 per hour. A snapshot shows the largest visible queue before C, but planner Eli must identify what limits sustained route output under the stated model.

Your role and the reference condition

System analyst working with all three process owners.

Normal: The constraint hypothesis explains system delivery within a defined route, mix and period.

Gap: The team assumes the largest current pile must identify the constraint, without checking its release history.

Work within these conditions

1. Single route, comparable effective capacities, stable stated mix and available demand are supplied assumptions.
2. The snapshot does not prove steady-state behavior or identify the cause of any capacity loss.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Three stage-rate cards, two demand cards and a queue snapshot
2. State observation sheet

Minutes	Activity and coaching prompt
4	Set the boundary Are these rates genuinely comparable?
7	Choose the first hypothesis Why is the largest queue not enough?
9	Apply the demand-change variant What makes a slow stage become binding?
5	Plan observation Which state would suggest an upstream policy problem?

Debrief

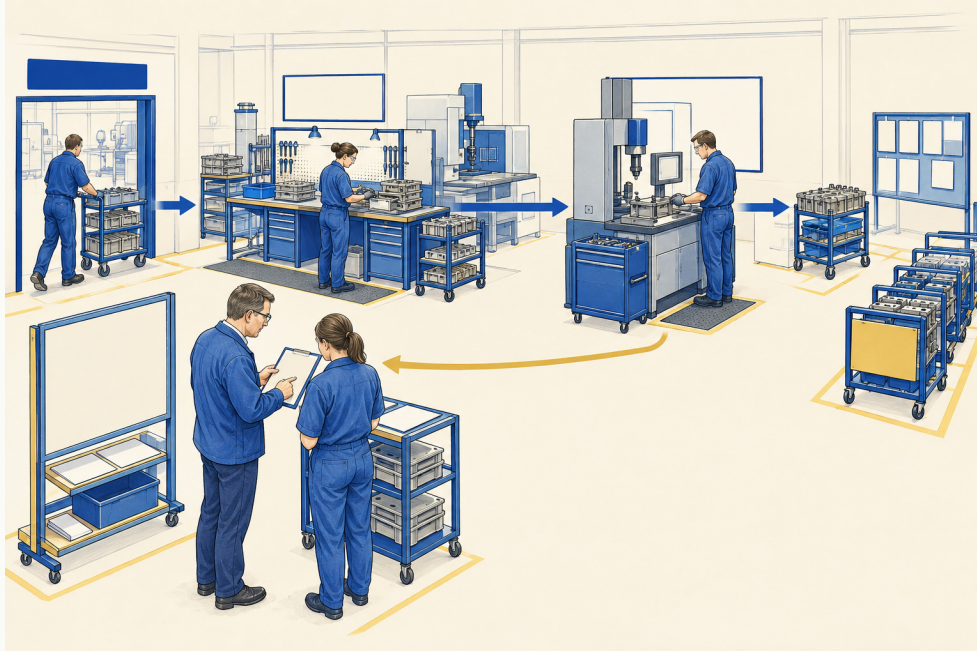
1. Challenge unsupported claims from one snapshot.
2. Ask learners to name the evidence that would change their mind.

Individual or remote practice

Write assumptions before computing the rate comparison, then choose observations that test the suspected mechanism.

Drum-buffer-rope: schedule, protect, release

Derive controlled release times from a supplied constraint schedule and protective lead, respond to a threatened job, and avoid early release that adds congestion without protecting throughput.



Release for the constraint's need

Fictional job-shop exercise: a specialist test station is the validated constraint for the current product mix. Planner Arun has scheduled jobs J41, J42 and J43 there. Upstream preparation is faster but has variable interruptions. Releasing all jobs at 08:00 fills the aisle and obscures which one the test station needs next.

Your role and the reference condition

Planner coordinating upstream preparation, material movement and the constraint operator.

Normal: The release gate follows the approved constraint schedule and protects timely arrival of the required, quality-ready work.

Gap: The upstream supervisor wants to release the whole day's work immediately to keep every local station busy.

Work within these conditions

1. Constraint validity is supplied for the exercise; real use requires demand, capacity, routing and loss evidence.
2. The illustrative 90-minute release-to-drum lead includes 30 minutes of nominal preparation/travel plus 60 minutes of protective allowance. It is not an additional 90-minute queue.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Clock timeline and three job tokens
2. Blank release/readiness record
3. Delayed-job card; calculator optional

Minutes	Activity and coaching prompt
5	Clarify the scheduling reference Which resource's need governs release here?
7	Demonstrate subtraction and protection What is included in 90 minutes?
10	Complete the changed-lead practice How much protection remains after the late start?
6	Debrief the threatened appointment Would more unrelated work help J42 arrive?

Debrief

1. If a learner subtracts another 60 minutes, revisit the stated total lead.
2. If the response is expedite everything, identify the single threatened job and its blocker.

Individual or remote practice

Draw planned and revised timestamps on one timeline, then explain the information return from drum to release.

Buffer management: priorities and recurring causes

Use a declared buffer-priority policy to choose an eligible next action, expose blocked high-risk work and distinguish immediate recovery from recurring-cause improvement.



The red status needs an action, not another color

Fictional planning team: three jobs have locally defined protective-time statuses. J1 has high consumption but lacks a required drawing approval. J2 has increasing consumption and is ready; J3 has lower consumption and is ready. Coordinator Rhea must apply the local rule and investigate repeated approval delays.

Your role and the reference condition

Planning coordinator with the work-center and approval owners.

Normal: Protection status informs priorities and response without bypassing readiness or quality requirements.

Gap: The team considers starting blocked J1 because its color is strongest, or enlarging every buffer to make the red statuses disappear.

Work within these conditions

1. The case supplies qualitative zones only; no universal percentages or sizing algorithm are prescribed.
2. Local policy: work on the highest-priority eligible job and escalate blocked high-consumption work in parallel.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Job cards with separate status and readiness fields
2. Recurring-cause log; answer kept separate

Minutes	Activity and coaching prompt
4	Explain the status Which clock and rule make the display meaningful?
8	Dispatch the original jobs How can the team help J1 while working J2?
8	Use the K-job variant What does three material episodes establish, and what not?
5	Review protection What outcome would justify a parameter change?

Debrief

1. Reject invented universal zone percentages.
2. Ask who owns the missing approval or material decision.

Individual or remote practice

Write a dispatch decision and a separate improvement question before opening the answer.

Throughput versus local utilization

Calculate throughput contribution per constraint-minute, apply demand and commitment limits, and distinguish the resulting teaching comparison from a complete profit or investment decision.



Equal contribution, different use of the constraint

Fictional product comparison: A sells for 100 monetary units with 40 truly variable cost and consumes 10 minutes of the verified binding constraint. B sells for 90 with 30 truly variable cost and consumes five constraint-minutes. Analyst Noor compares the use of scarce time rather than rewarding every department for staying busy.

Your role and the reference condition

Operations planner working with the accountable finance and commercial owners.

Normal: The selected feasible work supports sold throughput and commitments under the system's real constraints.

Gap: Both products show a 60-unit contribution per sale, so the team assumes either mix uses the constraint equally well.

Work within these conditions

1. One verified binding constraint and comparable time/cost definitions are supplied teaching assumptions.
2. Demand, commitments, operating-expense changes and other constraints must be checked before an actual mix decision.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Product data cards, 120-minute capacity grid and calculator
2. A separate minimum-commitment card

Minutes	Activity and coaching prompt
4	Define the comparison Which costs and scarce time are actually supplied?
7	Compute A and B Why does equal contribution not imply equal rate?
10	Allocate C and D How does the commitment change a rate-only preference?
4	State the limitation What is missing before anyone can call this profit?

Debrief

1. Require units on both rate calculations.
2. Ask learners to test the tempting eight-D-first answer against the C commitment.

Individual or remote practice

Calculate each rate, write constraints separately, then audit the feasible quantities before checking the solution.

Critical chain: dependencies, resources and buffers

Distinguish task dependencies from shared-resource ordering, retain an independent feeder and its protection, and identify why an un-timed network cannot establish a promised completion date.



Two ready tasks still need one specialist

Fictional engineering project: tasks A and B can both start after the project is ready, but each needs the same specialist. Integration requires outputs from A, B and an independent feeder F performed by another resource. Planner Hana must turn the logical network into a resource-feasible proposal. Durations and buffer sizes are not supplied.

Your role and the reference condition

Project planner with task owners and the shared specialist.

Normal: The plan respects prerequisites, finite resource availability and the accepted project outcome.

Gap: A schedule starts A and B simultaneously and omits the feeder's joining risk.

Work within these conditions

1. A-before-B is the illustrative resource ordering, not a claim that B technically depends on A.
2. No durations are supplied; the example cannot calculate a critical chain length or justified buffer size.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Task cards, two resource lanes and two distinct protection symbols
2. Blank network; no fabricated time grid

Minutes	Activity and coaching prompt
4	Separate two kinds of readiness Can both tasks be ready while only one can run?
8	Build the A/B/F network Which link is caused only by the shared specialist?
8	Solve the C/D/E case What makes the feeder independent?
5	Challenge a promised date Which missing inputs make that promise unsupported?

Debrief

1. Ask learners to redraw the feeder after the resource-change exception.
2. Do not accept a numeric buffer inserted without a basis.

Individual or remote practice

Use different line styles for prerequisites and resource order, then audit every integration input.

Conflict cloud: challenge assumptions

State a shared objective, represent both legitimate needs fairly, expose the assumptions behind incompatible actions and design a test that checks both needs and unwanted effects.



Large batches and small batches are positions

Fictional workshop: production manager Arun wants large batches to use scarce setup capability responsibly. Customer-service manager Mei wants small batches to respond to changing demand. Both want reliable delivery. Facilitator Sol helps them investigate the apparent conflict without treating either person as the problem.

Your role and the reference condition

Neutral facilitator with both decision owners and affected operators.

Normal: An improvement should meet the legitimate needs behind both positions and preserve necessary quality and safety conditions.

Gap: A proposed compromise batch size has been chosen before anyone tests why each action is believed necessary.

Work within these conditions

1. The cloud represents necessity assumptions to examine, not proof that the arrows are true.
2. The proposed injection is a hypothesis that requires practical validation.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Five cloud-element cards and an assumption log
2. Separate trial/undesirable-effect sheet

Minutes	Activity and coaching prompt
4	Agree the shared objective Would both owners sign this wording?
8	Separate positions from needs Why is batch size an action rather than the underlying need?
8	Build the office cloud Which necessity assumption might the daily slot change?
5	Design the test How could the proposal help one side but harm the other?

Debrief

1. Invite each participant to restate the other person's need accurately.
2. Distinguish an untested assumption from a verified process restriction.

Individual or remote practice

Write both sides in respectful first-person language, then test one arrow rather than arguing for a favored action.

Lean and TOC: complementary questions, distinct controls

Select a bounded improvement from system evidence using Lean and TOC questions, preserve distinct release controls and evaluate the effect at the customer boundary.



The next project needs a reason beyond its tool name

Fictional repair route: preparation can supply 14 eligible units per hour, test can accept eight, and dispatch can handle 12. Demand is 10. Test loses time to incomplete kits, while a proposal promises to raise preparation from 14 to 18. Team lead Farah must choose a useful next experiment.

Your role and the reference condition

Improvement lead with preparation, test, dispatch and planning owners.

Normal: The team improves reliable accepted delivery while maintaining quality, safety and manageable work.

Gap: A local speed project is being selected because it is easy to measure, without explaining how more prepared units will pass through test.

Work within these conditions

1. The rates are supplied comparable teaching values for the same mix; observe the real constraint mechanism.
2. Necessary safety and quality problems require response wherever they occur, including nonconstraint processes.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Route-rate cards, kit/document examples and two proposal cards
2. Trial prediction and system-outcome sheet

Minutes	Activity and coaching prompt
4	State the outcome What must reach the customer, and under which conditions?
8	Ask both sets of questions What do operators see, and what limits useful system output?
8	Compare the office proposals Could a readiness check simply move the queue?
5	Define the control and review Which release rule remains authoritative?

Debrief

1. Reject tool-first answers without an observed mechanism.
2. Use the safety exception to check that necessary conditions remain explicit.

Individual or remote practice

Write the same problem through both question sets, then choose one test with a falsifiable prediction.

Choose the quality tool for the question

Turn a vague quality concern into an answerable question, select a suitable evidence display, and state what that display cannot establish.



A pile of records is not yet a question

Fictional case: Vale Dispatch has delivery complaints, measured packing times and a list of possible causes. Coordinator Lina is asked to produce a quality chart for the weekly meeting. The manager wants to know where to begin, while a technician wants to know whether packing time changes with batch size. These are different questions; one attractive chart cannot answer both.

Your role and the reference condition

Dispatch coordinator and process analyst

Normal: Every proposed display has a stated question, an observation unit, a defined window and an honest limit of inference. Raw records retain their original identities.

Gap: A draft slide mixes complaints, hours and suggested causes into one descending bar chart. Its title says the biggest bar is the root cause.

Work within these conditions

1. The seven-tool overview is a selection aid, not a compulsory sequence.
2. A severe isolated complaint can require immediate response even when it ranks low by frequency.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Blank question-to-tool sheet
2. Three evidence cards
3. Answer kept separately

Minutes	Activity and coaching prompt
4	Frame the meeting request What decision is hidden inside "make a quality chart"?
8	Match and challenge Defend a tool, then name what it cannot tell us.
10	Complete the clinic exercise Which unit belongs on each axis or total?
5	Debrief transfer What raw information must survive the display?

Debrief

1. Accept alternative suitable tools when the question and boundaries are explicit.
2. Challenge any claim of a cause based only on ranking or consensus.

Individual or remote practice

Individually write each request as a question before looking at the seven-tool overview.

Record defects without changing the denominator

Record one inspection consistently and reconcile nonconforming units separately from the total number of nonconformities.



Six affected units, eight recorded faults

Fictional case: an incoming-inspection team checks 50 covers during one defined receipt window. The core illustration retains six nonconforming units and eight nonconformities. Inspector Arun must produce a record that another inspector can reproduce. The supervisor has called both numbers "rejects", making the reported rate ambiguous.

Your role and the reference condition

Incoming inspector and quality record owner

Normal: Each inspected cover has one identity; every observed category is recorded once under an agreed definition; total inspected units and affected-unit count remain explicit.

Gap: U01 and U02 each have two different faults. Counting every mark as a different rejected cover would exaggerate the fraction of units affected.

Work within these conditions

1. This is a complete fictional 50-unit inspection record, not a sampling acceptance plan.
2. Category definitions describe observed conditions; they do not prove process causes.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Blank unit-by-category grid
2. Six fictional unit cards
3. Separate receipt exercise

Minutes	Activity and coaching prompt
5	Define a unit Can one cover contribute two marks?
7	Demonstrate the tally Keep U01 visible while calculating both numerators.
9	Reconcile the changed receipt Where does each of the six marks come from?
5	Debrief What information would a tally-only summary lose?

Debrief

1. Ask learners to explain 10% and 0.15 in ordinary language.
2. Use an ambiguous scratch to discuss definition quality rather than force agreement.

Individual or remote practice

Draw the four affected practice units before doing the arithmetic.

Rank problems on one declared basis

Construct and interpret a ranking on one declared basis, then distinguish a frequency priority from a severity or causal decision.



The largest count is not automatically the largest loss

Fictional case: Fern Finishing records 50 nonconformities in one inspection window: 24 scratches, 16 burrs, eight missing labels and two other faults. These exact values remain in the core chart. Team leader Rosa wants to choose a starting investigation. A colleague proposes adding estimated repair dollars to the occurrence counts and calling the combined bars an impact score.

Your role and the reference condition

Team leader and quality analyst

Normal: A ranking uses one meaningful unit, a defined observation window and mutually understood categories. The underlying event list remains available for investigation.

Gap: The draft mixes frequency and money and labels the first two categories "80% of our causes". The record contains occurrences, not verified causes.

Work within these conditions

1. The categories describe faults and may involve different mechanisms.
2. A rare severe event may deserve a separate immediate response regardless of rank.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Count cards
2. Blank cumulative table
3. Separate minutes worksheet

Minutes	Activity and coaching prompt
4	Name the question Which unit is being ranked?
8	Build the two records Why must minutes not be added to counts?
10	Complete the changed week Where does the cumulative line finish and why?
5	Debrief the severe exception Which decision is outside this frequency chart?

Debrief

1. Ask a learner to defend a time-focused priority without altering the count chart.
2. Require a plain-language statement of the uncertainty behind per-event durations.

Individual or remote practice

Sort paper category cards, calculate cumulative totals, then open the answer.

See the distribution without losing the sequence

Place measurements into explicit adjacent bins, reconcile the distribution, and preserve the time and source information needed for later questions.



A useful distribution still needs its original records

Fictional case: Alto Inspection groups twenty width measurements into bins from 9.80 to 10.20 mm. The core histogram retains counts 2, 8, 7 and 3. Analyst Nia must explain a width exactly equal to 10.00 mm and respond to a claim that the tidy shape proves the process is stable.

Your role and the reference condition

Quality analyst and measurement-record owner

Normal: Every measured value belongs to exactly one bin under a documented endpoint convention. Units, instrument resolution, observation identities and time order are retained.

Gap: Two spreadsheet users assign 10.00 to different bins; one includes it in both. The slide omits time order and calls the process controlled.

Work within these conditions

1. The twenty observations are synthetic and are not a baseline study.
2. A histogram alone cannot establish sequence behavior, process capability or causation.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Eight measurement cards
2. Four bin envelopes
3. Blank reconciliation table

Minutes	Activity and coaching prompt
4	Frame the boundary problem Where should a shared-edge value go?
7	Sort and reconcile Try the convention before discussing shape.
10	Compare two orders Can the same values tell different time stories?
5	Debrief What information did grouping hide?

Debrief

1. Ask learners to construct two orders with identical histograms.
2. Do not reward a smoother-looking chart produced by hiding observations.

Individual or remote practice

Place the eight numbers into bins on paper, then write a two-sentence interpretation and boundary.

Test a relationship without declaring a cause

Preserve observation pairs, describe an association accurately, and design a next comparison that can distinguish rival explanations.



An upward pattern without a causal verdict

Fictional case: a training simulation pairs setting indices 1-6 with response scores 4,5,5,7,8,8. These exact pairs remain in the core scatter plot. Learner Ben is asked whether increasing the setting causes a better response. The numbers are synthetic indices, with no machine operating meaning or calibrated prediction rule.

Your role and the reference condition

Improvement analyst with the process owner

Normal: Each plotted point represents one intact paired observation. Units, context and possible shared influences are recorded; conclusions match the evidence.

Gap: The team sorts setting and response separately, then proposes a machine adjustment from the positive-looking graph.

Work within these conditions

1. The fictional setting is not an equipment setpoint.
2. Six observational pairs cannot establish a safe intervention, causal effect or reliable prediction.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Paired observation cards
2. Blank axes
3. Two colors for observed and hypothesized statements

Minutes	Activity and coaching prompt
4	Define a point What makes two values a pair?
8	Interpret the supplied graph Which sentence is supported and which is causal?
10	Expose the sorted-column error Compare actual and invented pairs.
5	Debrief the next test What design would separate setting from order?

Debrief

1. Reject safe-setting recommendations from synthetic indices.
2. Ask what result would weaken the preferred hypothesis.

Individual or remote practice

Plot the changed pairs by hand, then label each conclusion as observation, hypothesis or proposed test.

Unmix the data before blaming a shift

Compare meaningful groups with their denominators and context, and distinguish an observed difference from a causal explanation.



Fewer failures can still mean a higher observed rate

Fictional case: Brook Assembly reports eight nonconforming units from 100 inspected on line A and two from 20 on line B. Those values remain unchanged in the core exhibit. Supervisor Mara wants to congratulate line B for having fewer failures and assign corrective training to line A. Analyst Jo must reconstruct a fair comparison before the meeting.

Your role and the reference condition

Quality analyst with both line leaders

Normal: The response definition, observation period and inspection method are comparable. Each source retains numerator, denominator and product/operating context.

Gap: Raw counts hide unequal inspection amounts. Product mix, inspection differences and small-sample uncertainty remain unresolved.

Work within these conditions

1. The groups are observational and small.
2. The exercise compares observed rates; it does not estimate a causal line effect or prove statistical significance.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Source-labelled unit records
2. Calculator
3. Blank comparison table

Minutes	Activity and coaching prompt
4	Challenge the count-only story Which line looks better before dividing?
8	Reconcile the pooled value Why is 8.33% nearer 8%?
10	Complete the changed comparison What makes a fair product comparison?
5	Debrief attribution Which sentence would unfairly blame a team?

Debrief

1. Ask learners to explain unequal weighting with units rather than a formula alone.
2. Separate containment of known product from investigation of the source pattern.

Individual or remote practice

Write a careful meeting statement containing both rates, sample sizes and one remaining uncertainty.

Turn fishbone branches into testable hypotheses

Convert a list of possible causes into competing, testable explanations with explicit evidence states.



Three branches, zero verified causes

Fictional case: seam-width variation at Cedar Fabrication prompts three suggestions: fixture positioning differs, observers measure differently, or material thickness changes. The core fishbone preserves these three hypotheses and zero verified causes. Facilitator Elena must turn the discussion into a useful test plan without allowing agreement to become proof.

Your role and the reference condition

Improvement facilitator with measurement and process specialists

Normal: The effect has a defined scope; observations and hypotheses use different labels; a proposed test predicts what would differ under competing explanations.

Gap: The team votes fixture positioning as the root cause because it is the most familiar explanation. No comparison or corroborating record has been supplied.

Work within these conditions

1. The scenario contains no authorized repair or production-setting instruction.
2. A supported cause remains bounded by the conditions and uncertainty of the evidence.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Blank hypothesis/test cards
2. Three original branch cards
3. Retained-case fact sheet

Minutes	Activity and coaching prompt
5	Write the neutral effect Does the statement already blame something?
8	Design a rival test What result would weaken the favorite?
10	Apply occurrence and escape Can the carton become wrong and then escape for different reasons?
5	Debrief uncertainty When is inconclusive the correct answer?

Debrief

1. Reward an explicit evidence gap rather than a confident unsupported cause.
2. Require an authorized test boundary for equipment or product challenges.

Individual or remote practice

Write two rival predictions and leave results blank until evidence is supplied.

Select a chart from the data and sampling plan

Select a monitoring candidate from the observation type and sampling design, then identify the assumptions that still need review.



The word defect is not a data model

Fictional case: a monitoring workshop receives six records: individual widths, small width subgroups, rejected-unit fractions, fixed-size reject counts, fixed-area blemish counts and varying-area blemish rates. The core chooser retains six distinct routes. Engineer Sal must assign candidates without pretending that a chart name approves the collection plan.

Your role and the reference condition

Quality engineer and process record owner

Normal: The team knows what one observation means, its time order, subgroup or exposure basis and whether a unit can contribute more than one event.

Gap: Every record has been labelled defects. A proposed p chart would treat multiple blemishes on one sheet as though they were different rejected sheets.

Work within these conditions

1. These are introductory candidates; dependence, overdispersion and rare events can require other methods.
2. Control limits describe process behavior under a model, not product specifications.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Six source-record cards
2. Blank chooser table
3. Changed four-record exercise

Minutes	Activity and coaching prompt
5	Define the observation Can one item contribute more than one count?
8	Explain each route What changes when n or exposure changes?
10	Challenge the mixed subgroup What variation would pooling hide?
5	Debrief implementation Who approves the baseline and response?

Debrief

1. Do not mark a justified fixed-n p alternative wrong.
2. Require an assumption check even for a correctly named chart.

Individual or remote practice

Annotate the sampling mechanism before looking up any chart name.

Separate control limits from specifications

Classify product conformance and a process signal separately, record the appropriate response, and explain what the supplied chart cannot establish.



A passing part can still carry a process warning

Fictional training case: quality technician Sam reviews width measurements from two different processes. The baseline center and statistical limits are supplied and approved for this exercise; the six displayed values are recent observations, not the data used to calculate those limits. Engineering specifications describe each product requirement.

Your role and the reference condition

Quality technician working with the process owner under a defined reaction plan.

Normal: The measurement, units, relevant process and chart baseline are identified before interpretation. Product acceptance is assessed against specifications; process behavior is assessed against the chart rules.

Gap: A colleague labels every in-specification observation green and proposes ignoring process B sample 5 because it still meets the drawing.

Work within these conditions

1. Only the beyond-limit signal rule is illustrated; other approved pattern rules are not evaluated here.
2. Baseline suitability and measurement adequacy are supplied teaching assumptions, not proven by these six points.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Two labelled native charts and the supplied values
2. Blank dual-decision record
3. Ruler or highlighter; separate answer

Minutes	Activity and coaching prompt
5	Name the lines Who or what established each line?
8	Demonstrate the two decisions What does B sample 5 require despite meeting specification?
9	Complete changed-case record How does observation 2 differ from 3?
6	Challenge the baseline What if these limits came from another setup?

Debrief

1. If a learner writes all good, ask whether they answered product or process status.
2. Ask for the missing evidence before accepting a capability claim.

Individual or remote practice

Complete the two classifications in separate columns before writing any response; then compare each with the answer.

Read spread before the subgroup average

Apply supplied subgroup baseline constants, interpret spread before the mean, and record a signal response without confusing limits with specifications.



A quiet average can hide an abnormal range

Fictional case: a width process samples five consecutive units per subgroup. A prior reviewed baseline is supplied as grand mean 20.00 mm and average range 0.50 mm. The core charts show six illustrative subgroup means and ranges; those six points are not used to estimate the baseline. Technician Imani checks the calculations and prepares a response record.

Your role and the reference condition

SPC technician with the process owner

Normal: Subgroup size is five; measurement and subgroup rationale remain appropriate; historical limits are clearly identified and applied to later observations.

Gap: The draft report recomputes limits from the six demonstration points and reads the mean chart first. That changes the stated evidence and can hide a spread problem.

Work within these conditions

1. Supplied baseline adequacy is an exercise assumption, not newly demonstrated by these six points.
2. No product specifications or automatic release criteria are supplied.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Baseline card
2. Calculator
3. Blank signal record

Minutes	Activity and coaching prompt
5	Identify the source of limits Which numbers are supplied rather than estimated here?
8	Calculate and read spread What can a near-center average hide?
10	Complete the 30 mm case Which point signals and under what rule?
5	Debrief response What would be wrong with widening the limit?

Debrief

1. Ask for units on every limit.
2. Distinguish no observed point signal from demonstrated long-run control.

Individual or remote practice

Work both charts on paper and write the reaction before revealing the answer.

Monitor one reading at a time

Calculate adjacent moving ranges and use supplied historical limits without losing time order or turning a signal into an equipment command.



The gap between neighbors matters

Fictional case: Juniper Batch records one width per batch. Supplied historical mean is 10.00 mm and MRbar is 0.1128 mm. Six subsequent illustrative readings are 10.00, 10.12, 10.04, 9.94, 10.08, 10.01 mm. Analyst Owen checks the individuals and moving-range records. The core exhibit retains these exact values and historical parameters.

Your role and the reference condition

Process analyst and batch-record owner

Normal: Each reading retains its batch order and measurement context; moving ranges compare successive observations; baseline assumptions and the reaction rule are explicit.

Gap: A spreadsheet sorts readings before calculating ranges and derives a new baseline from the six-point illustration.

Work within these conditions

1. A single measurement per batch does not guarantee independence.
2. This calculation lesson does not establish a process capability study or prescribe a machine adjustment.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Ordered batch cards
2. Calculator
3. Blank pair-to-range table

Minutes	Activity and coaching prompt
5	Identify neighbors Why are there five ranges for six displayed readings?
8	Compare historical and plotted averages Which baseline is this exercise using?
10	Complete the 5 mm sequence Which records belong in the investigation?
5	Debrief How would dependence affect confidence in the method?

Debrief

1. Ask learners to calculate one range aloud from its two readings.
2. Do not let a correct limit calculation imply adequate sampling design.

Individual or remote practice

Preserve the written observation order and annotate each difference between adjacent rows.

Chart nonconforming units with the right denominator

Keep nonconforming-unit counts linked to sample size, calculate the appropriate fraction or fixed-size count limits, and interpret a changed denominator.



Twice the count, the same fraction

Fictional case: an inspection desk classifies each item once as conforming or nonconforming. A supplied historical fraction is .10. The core p example uses sample sizes 100,200,100,200 and counts 8,24,11,17; the separate np example always inspects 100 and records 8,12,11,9. Analyst Pia explains why limits must reflect the observation design.

Your role and the reference condition

Quality analyst and inspection owner

Normal: Every sample records its actual inspected amount; one item contributes at most one nonconforming classification; model and baseline are suitable for the declared process.

Gap: A supervisor compares 24 failed items in 200 with 12 in 100 and declares the larger sample twice as bad. Both are 12%.

Work within these conditions

1. Historical $\bar{p} = .10$ is supplied, not estimated from these four samples.
2. Dependence, overdispersion or changing risk can require another model; these are not acceptance-sampling limits.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Sample-size/count cards
2. Calculator
3. Blank response record

Minutes	Activity and coaching prompt
5	Define affected units Can one item contribute three here?
8	Compare n100 and n200 Why do fraction limits narrow?
10	Evaluate 36 of 200 What denominator and limit apply?
5	Debrief Why does a chart not authorize product release?

Debrief

1. Ask learners to explain why 12/100 and 24/200 are equal.
2. Challenge the unsupported 36% calculation by tracing the inspected population.

Individual or remote practice

Write n next to each numerator before choosing a plotting scale.

Chart nonconformities per exposure

Distinguish counts of multiple nonconformities from affected-unit fractions and account for the actual opportunity exposed to inspection.



A larger inspected area offers more opportunities

Fictional case: a surface-inspection team counts blemishes, with several possible on one sheet. The core c chart is a separate fixed-exposure process with supplied cbar 9 and counts 8,12,7,9. The u example has supplied ubar .5 per square metre, areas 20,80,20,80 and counts 8,44,13,38. Analyst Hugo must keep the two baselines and scales separate.

Your role and the reference condition

Surface-quality analyst and inspection lead

Normal: The record defines a blemish, the inspected opportunity and comparable conditions. Counts and exposure remain available, even when rates are displayed.

Gap: The team calls 44 blemishes worse than 13 without considering 80 versus 20 square metres, and combines both fictional baselines into one calculation.

Work within these conditions

1. The two core panels are separate illustrative processes, not a common fitted dataset.
2. A suitable count model and comparable opportunity are assumptions to check; clustering or skewed rare counts need care.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Area/count cards
2. Calculator
3. Two separately titled process records

Minutes	Activity and coaching prompt
5	Define a blemish event How can one sheet contribute several?
8	Compare rate and count Why is 44 not automatically worse than 13?
10	Work the changed observations Which baseline belongs to each?
5	Debrief opportunity When does equal area fail to mean equal opportunity?

Debrief

1. Ask for per-m² units on the u calculation.
2. Keep the c and u examples physically separate during the exercise.

Individual or remote practice

Calculate each rate from its own count and area before examining limits.

Respond to a signal with a defined owner

Construct an evidence-based suspect boundary, reconcile affected locations, and distinguish restoration, verification and authorized release.



The first boundary is a starting point

Fictional training case: at a machining cell the check on serial 140 fails. Serial 100 is the last verified acceptable checkpoint in the supplied record. Team leader Jules follows the local reaction plan and must locate potentially affected output before the next move. The precise technical fault is not supplied.

Your role and the reference condition

Team leader coordinating quality, downstream supervision and the authorized process specialist.

Normal: The checkpoint record is traceable to the correct characteristic, method and serial. Potentially affected output remains identifiable until disposition.

Gap: The cell has only 15 suspect pieces beside it, while 25 have already moved downstream or to packing. Someone proposes holding only the visible pieces.

Work within these conditions

1. The initial interval assumes serial order represents production order and the serial 100 checkpoint is trustworthy.

2. A passing restart check does not itself authorize release of earlier output; the applicable reaction/disposition plan controls that decision.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Serial-range cards for cell/downstream/packing
2. Blank exposure and disposition record
3. Separate checkpoint-invalid card for exception

Minutes	Activity and coaching prompt
5	Frame the signal and boundary Why is 100 not counted in 101-140?
7	Move range cards to locations Where are the pieces that have left the cell?
9	Complete the missing-serial practice Which acknowledgment is still absent?
6	Reveal checkpoint change and debrief What evidence could enlarge your initial scope?

Debrief

1. If a learner counts only cell stock, follow one downstream handoff.
2. Ask who can release output and what record supports that authority.

Individual or remote practice

Draw the boundary and locations before counting; compare both the total and the unresolved questions with the answer.

Check stability before capability

Calculate and interpret Cp and Cpk from explicitly supplied stable-normal parameters while keeping evidence prerequisites and acceptance authority separate.



A good-looking index is not a qualification record

Fictional case: a width process is supplied as stable and approximately normal with mean 10.01 mm and sigma .02 mm. Specifications are 9.90-10.10 mm. These parameters and the existing native distribution remain unchanged. Engineer Asha must explain why Cp and Cpk differ and whether either number authorizes production acceptance.

Your role and the reference condition

Quality engineer with the customer-requirements owner

Normal: Distribution, stability, measurement fitness, sampling and specification authority are established for the intended use before a capability conclusion is applied.

Gap: A slide presents 1.667 as a universal passing score and treats the six-point SPC illustration from another lesson as proof of this process's stability.

Work within these conditions

1. The parameters are supplied synthetic assumptions, not estimates from customer production.
2. No universal acceptance threshold, confidence bound or customer approval is supplied.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Parameter cards
2. Calculator
3. Prerequisite/decision record

Minutes	Activity and coaching prompt
5	Identify the two authorities Which numbers come from requirements and which from the process?
8	Calculate both indices Why is the upper side limiting?
10	Work the changed case What does the calculation still not prove?
5	Debrief drift Why can Cp stay constant while risk changes?

Debrief

1. Require the learner to name the supplied assumptions.
2. Do not award a pass/fail verdict without stated applicable criteria.

Individual or remote practice

Draw the two mean-to-limit distances before calculating Cpk.

Separate part variation from measurement variation

Distinguish measurement-study design from supplied variance estimates and explain why standard-deviation and variance percentages differ.



Twenty percent and four percent can both be correct

Fictional case: a gauge study uses ten representative parts, three operators and two repeated measurements, giving 60 readings. The core exhibit supplies repeatability SD .003 mm, reproducibility SD .004 mm and total study SD .025 mm. Metrologist Eve must explain a report that labels gauge variation both 20% and 4%, without claiming these components were calculated from an unseen raw dataset.

Your role and the reference condition

Measurement-system specialist and inspection owner

Normal: The study represents intended parts, appraisers and conditions; repeats preserve identity and avoid memory effects; the analysis method and denominator are explicit.

Gap: A manager adds .003 and .004 to obtain .007 mm and treats the larger percentage as evidence that the smaller one is dishonest.

Work within these conditions

1. Components are supplied estimates for an arithmetic illustration.
2. No universal acceptance threshold or complete MSA conclusion is supplied.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Measurement schedule
2. Component cards
3. Calculator

Minutes	Activity and coaching prompt
5	Describe a repeat How would memory of a reading bias the exercise?
8	Combine components Why square before adding?
10	Work the changed estimates How can 20% and 4% agree?
5	Debrief fitness What can this ratio not tell us?

Debrief

1. Ask learners to state the denominator aloud.
2. Challenge the idea that one example design is a universal minimum.

Individual or remote practice

Draw a units column beside every intermediate calculation.

Check inspection agreement and escape risk

Read a reference-classification matrix, distinguish overall agreement from the two error directions, and recognize the limits of a single pass.



High agreement can hide an important error direction

Fictional case: inspector Leo assesses 40 reference items. Of 20 reference-bad items, 18 are rejected and 2 accepted. Of 20 reference-good items, 19 are accepted and 1 rejected. The core matrix retains these exact counts. The team calls 92.5% agreement proof that inspection is repeatable.

Your role and the reference condition

Inspection-method owner and appraiser coach

Normal: Reference status is trustworthy for the defined characteristic; item identity and decision are retained; repeated and between-appraiser comparisons are designed separately.

Gap: One aggregate percentage hides false acceptance and false rejection, and one pass has no repeated classifications from which to judge repeatability.

Work within these conditions

1. This is an illustrative single pass, not a completed attribute measurement-system qualification.
2. The balanced 20/20 reference sample is not a production prevalence estimate.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Reference/classification cards
2. Blank matrix
3. Separate answer sheet

Minutes	Activity and coaching prompt
5	Define a matrix cell Which items belong in false acceptance?
8	Compare three percentages What denominator changes?
10	Work unequal groups Which error is hidden by one total?
5	Debrief next evidence How would a repeat be kept blind?

Debrief

1. Ask learners to explain the consequence of each error without inventing a universal threshold.
2. Treat disputed reference examples as method evidence, not automatic appraiser blame.

Individual or remote practice

Color the two matching cells, then calculate each conditional rate from its own reference row.

Link a process risk to an executable control plan

Translate a defined process risk into a station-ready control record with a method, sampling rationale, actual evidence and authorized reaction.



A tolerance by itself is not a control plan

Fictional case: OP20 produces a slot with an approved example width criterion 9.90-10.10 mm. A draft row says "check width" and gives a five-consecutive-units-every 50-produced sampling example. Engineer Farah must make the row usable by the station team while keeping that sampling pattern explicitly illustrative and subject to risk/containment approval.

Your role and the reference condition

Process engineer with quality, production and measurement owners

Normal: The controlled characteristic, requirement revision, suitable method, sampling basis, record, owner and abnormality/restart path agree across the process risk review and work instruction.

Gap: The operator cannot identify the gauge, record actual readings or determine who holds affected stock when a result is abnormal.

Work within these conditions

1. The fictional sampling interval is not a universal safe plan.
2. The teaching record is an original example, not a proprietary standard form or complete customer requirement set.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Incomplete OP30 row
2. Blank station record
3. Role cards

Minutes	Activity and coaching prompt
5	Read as an operator What decision cannot be made from this row?
8	Walk the OP20 example Where is actual evidence recorded?
10	Repair OP30 Which detail needs an owner rather than a guess?
5	Debrief change Which linked documents must agree?

Debrief

1. Accept different suitable record designs with clear ownership.
2. Challenge any arbitrary sample rate offered as universally adequate.

Individual or remote practice

Write the abnormal-result scenario first, then see whether the proposed row supports it.

Make the station check and reaction inseparable

Execute the full check-record-react-verify sequence at a station and preserve the actual abnormal reading and product identity.



Record 10.13, not a green tick

Fictional case: operator Noor measures a slot at 10.13 mm against the current example range 9.90-10.10 mm. The value and criterion remain unchanged from the core lesson. The previous record has only a signature, and downstream work is waiting. Noor must respond through the authorized station method rather than adjusting until a later reading looks acceptable.

Your role and the reference condition

Station operator with shift and quality support

Normal: Correct product/instruction identity, ready measurement method, actual observations and a clear abnormality response are available at the point of work.

Gap: The operator is encouraged to mark the check complete because a later part may pass. That would hide the original result and leave affected material unidentified.

Work within these conditions

1. No equipment adjustment or technical repair procedure is supplied.
2. The example range is a fictional product criterion, not a statistical control limit.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Abnormal-reading card
2. Blank ticket
3. Station-role map

Minutes	Activity and coaching prompt
5	Read the current criterion What exactly is abnormal?
8	Trace the response Who owns the affected material?
10	Work the unidentified reading What evidence can recover identity?
5	Debrief repeat measurement Why keep both results?

Debrief

1. Challenge any shortcut that deletes an unfavorable observation.
2. Ask learners to name the receiving role for each unresolved decision.

Individual or remote practice

Write the ticket so another shift can understand the value, identity gap and remaining decisions.

Build PFMEA from a failure chain to verified action

Build a coherent cause-mode-effect chain, distinguish prevention from detection, and connect a proposed risk action to verification and controlled documents.



Do not put the same phrase in every failure column

Fictional case: joint assembly can use the wrong program. The potential process failure is an under-tightened joint; the downstream effect is loss of joint function. Those distinctions remain in the core lesson. Facilitator Dev reviews a draft that repeats "wrong torque" in cause, mode and effect, with an invented risk number and a training action marked complete.

Your role and the reference condition

Cross-functional process-risk team with engineering and quality owners

Normal: Process structure and intended functions lead to specific failure chains, existing controls, applicable risk evaluation and verified actions.

Gap: The worksheet looks populated but cannot explain what fails, why it might happen or how an action would change the risk.

Work within these conditions

1. Use the applicable customer-authorized FMEA method and licensed criteria.
2. No proprietary severity/occurrence/detection or Action Priority tables are reproduced or inferred.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Blank failure-chain record
2. Control cards
3. No rating tables in this exercise

Minutes	Activity and coaching prompt
5	Define the function Who relies on the output?
8	Separate the chain Which phrase is the mode?
10	Review the label action What does the scan actually detect?
5	Debrief bypass Which path might the demonstration miss?

Debrief

1. Require mechanism-specific verification rather than "train and monitor".
2. Accept different controls when the function and authority are explicit.

Individual or remote practice

Draw the chain first, then connect each control to the cause or condition it addresses.

Use APQP gates to expose launch risk early

Use a launch evidence gate to expose dependencies and unresolved risk, with accountable decisions instead of a task-completion percentage.



Ninety-seven percent complete can still be unready

Fictional case: a new component launch has three open actions: measurement validation, supplier validation and a station reaction drill. Planner Tessa has a green schedule because most tasks are complete. The core lesson retains these three gaps. The team must decide what evidence is missing and who can authorize the next step.

Your role and the reference condition

Cross-functional launch leader with engineering, supplier quality and operations

Normal: Customer needs, design/process development, validation and operational controls are connected through clear deliverables and evidence-based decisions.

Gap: The team treats a high completion percentage as approval to launch, despite unresolved evidence needed to interpret product results and respond to abnormalities.

Work within these conditions

1. AIAG published APQP 3 and standalone Control Plan 1 in 2024; applicability and adoption remain customer-specific.
2. The three example actions are not a complete prescribed gate checklist.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Three action cards
2. Dependency map
3. Blank gate record

Minutes	Activity and coaching prompt
5	Name the decision What exactly would this gate authorize?
8	Map dependencies Which claims rely on the measurement action?
10	Work the changed launch Why can one gap matter more than two closures?
5	Debrief handover Who receives the controlled changes?

Debrief

1. Ask for actual evidence rather than a status color.
2. Do not let the exercise imply a universal customer gate or waiver.

Individual or remote practice

Write a one-paragraph gate recommendation with scope, evidence, remaining risk and decision owner.

Distinguish PPAP evidence from production authorization

Connect production evidence to the correct part and process revision, and distinguish submission, customer decision and continuing authorization conditions.



Submitted does not mean approved

Fictional case: supplier Meridian has assembled a production-evidence package for bracket M42 revision C. The actual run used process revision P7. Coordinator Ana finds an older approval for product revision B and a new submission receipt, but no applicable customer decision for C/P7. The core lesson's boundary remains: a collection of files is not production authorization.

Your role and the reference condition

Supplier quality coordinator with customer quality and engineering

Normal: Required evidence, submission conditions, product/process identity and the retained customer decision correspond to the intended production scope.

Gap: The shipping team sees a complete folder and treats the submission timestamp as approval. An old decision is reused because the part number looks similar.

Work within these conditions

1. The workflow is not a complete PPAP element list or a prescribed submission level.
2. Applicable customer requirements govern submission, change notification and authorization.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Revision and decision cards
2. Blank status record
3. Customer-requirement placeholder clearly marked missing

Minutes	Activity and coaching prompt
5	Separate the states What does receipt prove?
8	Trace the evidence scope Which run supports which revision?
10	Review the tool change What must be checked before extending approval?
5	Debrief conditions Who must see a limited decision?

Debrief

1. Do not ask learners to invent a PPAP level.
2. Challenge file-count or silence-as-approval reasoning.

Individual or remote practice

Write a status line that would remain truthful if read by shipping, engineering and customer quality.

Trace one suspect lot through split, merge and rework

Trace a suspect lot through both quantity and identity links, including split paths, destinations, WIP and scrap.



Four hundred accounted for is only the first check

Fictional case: input lot L70 contains 400 units and splits into path A250 and path B150. The retained core totals are 300 shipped, 80 in work and 20 scrapped. Trace coordinator Luis must identify where suspect material went. A balanced total is available, but one shipment record lacks its destination identity.

Your role and the reference condition

Trace coordinator with warehouse, production and quality owners

Normal: Every transformation or movement preserves source/output identity, quantities, status and destination. Rework links do not create or erase material.

Gap: The team declares the trace complete because $300+80+20=400$, even though the recipient of part of the shipped population is unresolved.

Work within these conditions

1. Quantity balance is necessary but not sufficient for trace completeness.
2. The example is a drill; actual containment or notification follows applicable authority.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Lot/path cards
2. Movement ledger
3. Blank trace-gap record

Minutes	Activity and coaching prompt
5	Define the starting scope Which descendants must be followed?
8	Reconcile both paths Can the total balance while one path is wrong?
10	Resolve L91 What does the rework note actually prove?
5	Debrief closure Which destination evidence remains necessary?

Debrief

1. Ask learners to identify mutually exclusive current statuses.
2. Keep notification decisions with the authorized quality owner.

Individual or remote practice

Draw the lot links, then attach each quantity to a verified status and destination.

Audit whether critical controls are actually followed

Observe a critical control at the work, record objective evidence and verify the response while keeping audit-completion metrics distinct from product quality.



Eight checks completed, two findings, no product-quality percentage

Fictional case: ten process checks were scheduled across leadership layers at Vale Assembly. Eight were completed and two findings recorded. These values remain unchanged in the core diagram. Supervisor Priya must report the results and follow an absent identity check through containment, action and a later observation.

Your role and the reference condition

Layered-audit coordinator and process leaders

Normal: Questions target specific critical controls, observers inspect actual work/records and findings reach an accountable response with verification.

Gap: The dashboard labels 80% completion as 80% quality and closes findings when a reminder email is sent.

Work within these conditions

1. Layered process checks are not a substitute for product inspection or a certification audit.
2. Cadence, questions and roles must fit the process and applicable requirements; this is not a copied CQI-8 form.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Schedule and finding cards
2. Blank observation record
3. Role map

Minutes	Activity and coaching prompt
5	Improve the question What could you actually observe?
8	Interpret the two rates Which population is each about?
10	Repair the email closure What evidence would demonstrate the control?
5	Debrief timing Which operating condition might a convenient visit miss?

Debrief

1. Ask learners to replace a blame phrase with an observation.
2. Do not reward low finding counts without examining observation quality.

Individual or remote practice

Write one audit question with its expected evidence and reaction owner.

Control special processes through qualified conditions and records

Connect a job to applicable scope, qualified conditions and retained run evidence, and route deviations through the authorized process.



The final test cannot recreate the missing process record

Fictional case: a special-process job J204 has a traveller naming procedure revision R6, but the retained run record references R5. Coordinator Sam must determine whether the job was performed under the applicable approved conditions. The core lesson retains the three evidence links - job identity, approved process revision and recorded run - with no technical recipe values.

Your role and the reference condition

Special-process coordinator with responsible engineering and quality

Normal: Applicable customer/program scope, procedure, personnel, equipment and run evidence are connected to the actual job; deviations have defined authority.

Gap: The team proposes accepting the job because the finished surface looks good, without resolving the procedure-revision mismatch.

Work within these conditions

1. No temperature, time, chemistry, pressure or machine-setting prescription is provided.
2. Automotive CQI assessments and Nadcap accreditation have different applicability and are not interchangeable.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Traveller/run references
2. Scope cards
3. Blank gap record

Minutes	Activity and coaching prompt
5	Define applicability Which process and site are actually covered?
8	Trace the mismatch What different explanations fit R 5/R6?
10	Work the missing segment Which evidence must not be invented?
5	Debrief verification How will the next job prove the capture fix?

Debrief

1. Do not ask learners to provide technical recipe values.
2. Keep current-job disposition separate from future system reliability.

Individual or remote practice

Draw the three evidence links and mark each as established, inconsistent or missing.

Prepare a Nadcap audit with scope-linked evidence

Build a traceable preparation record for a defined site/process scope, distinguish an evidence gap from a completed action, and describe readiness without claiming accreditation.



A tidy folder is not a verified evidence trail

Fictional preparation exercise: quality lead Ren works at Alder Aerospace, East site. A customer request concerns a defined heat-treatment process at East. The company's West site has a separate scope record. Ren is assembling a self-audit evidence trail for job HT204, but the training record is missing the link between its processing instruction and the applicable revision. No accreditation decision is supplied for East.

Your role and the reference condition

Quality lead coordinating the process owner and document-control owner; program questions go through the appropriate PRI channel.

Normal: The actual site/process/customer scope, applicable authorized criteria and job evidence are linked and current. Preparation status and accreditation status are recorded separately.

Gap: Management wants to mark preparation complete because a folder exists and an optional pre-assessment is booked. The job-to-instruction link remains unverified.

Work within these conditions

1. The evidence index below is an original learning aid, not an official Nadcap checklist or substitute for applicable audit criteria.
2. No technical heat-treatment limits, audit deadlines or guaranteed accreditation outcomes are invented here.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Fictional evidence cards only; no customer records needed
2. Blank original readiness index
3. Separate status and preparation labels

Minutes	Activity and coaching prompt
5	Set the authority boundary What can this learning index establish, and what requires the program authority?
8	Walk HT204 evidence trail Does today's procedure prove yesterday's applicability?
10	Complete North-site practice Which exact link is missing for ND71?
6	Debrief status claims How would you describe progress without claiming accreditation?

Debrief

1. If a learner writes obtain certificate, return to the missing job-specific evidence.
2. Accept alternative record structures if the scope, evidence, owner and verification remain traceable.

Individual or remote practice

Sort each supplied fact into scope, preparation, job evidence or authorized status before completing the gap record.

Close an NCR with verified action against recurrence

Separate containment, correction and cause-based corrective action, then verify effectiveness over relevant opportunities rather than closing on paperwork.



A new label does not restore an overdue gauge

Fictional case: gauge G18 is overdue for calibration and has been used in recent inspections. The core lesson already requires removing it from use, authorized calibration/status verification, review of affected measurement/product exposure and investigation of the scheduling weakness. Coordinator Mina must turn those responsibilities into a defensible NCR response.

Your role and the reference condition

Quality-system coordinator with metrology and product-quality owners

Normal: The nonconformance, exposure, current correction, causal evidence, system action and effectiveness decision are distinct and traceable.

Gap: The initial response replaces the sticker and says staff were reminded. It does not show calibration, prior impact review or why the schedule failed.

Work within these conditions

1. No technical calibration procedure or universal NCR closure deadline is supplied.
2. The response is an original training record, not an official Nadcap form or accreditation decision.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Gauge/status and schedule records
2. Blank NCR logic map
3. Separate implementation/effectiveness cards

Minutes	Activity and coaching prompt
5	Separate the responsibilities Which action restores the gauge and which addresses recurrence?
8	Test the cause What would contradict the reminder hypothesis?
10	Assess the quiet fortnight What opportunity was actually observed?
5	Debrief closure Which decisions remain open?

Debrief

1. Challenge a label-only correction and a reminder-only cause action.
2. Require an honest pending status when effectiveness evidence is absent.

Individual or remote practice

Write the response in four distinct evidence paragraphs before evaluating its completeness.

Locate the applicable automotive requirements

Identify the current automotive requirement authorities and distinguish the standard edition, certification Rules, interpretations, customer requirements and historical references.



Rules 6 is not a sixth edition of the standard

Fictional case: an automotive supplier receives a purchasing note saying "ISO/TS 16949 certified" and an internal slide titled "IATF sixth edition". Quality lead Ren must correct the references and identify the actual requirements applicable to a defined site/customer scope. Primary IATF pages were checked on 20 September 2026 for this lesson.

Your role and the reference condition

Automotive quality-system lead and customer interface

Normal: The requirement register identifies source, edition/revision, applicability, owner and review date.

Certification status is confirmed through authorized evidence, not inferred from training.

Gap: Historical ISO/TS wording and scheme Rules numbering are being treated as interchangeable current standard names.

Work within these conditions

1. IATF 16949:2016 first edition replaced ISO/TS 16949:2009.
2. Rules 6 became effective 1 January 2025; July 2026 planning places the second standard edition at mid-2027 with explicitly indicative timing.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Authority-name cards
2. Official-source links
3. Blank applicability register

Minutes	Activity and coaching prompt
5	Sort the document types Which edition number belongs to which document?
8	Review the current register What is published and what is planned?
10	Repair the launch slide Which claim requires evidence beyond a source lookup?
5	Debrief updates Who monitors a change and what triggers review?

Debrief

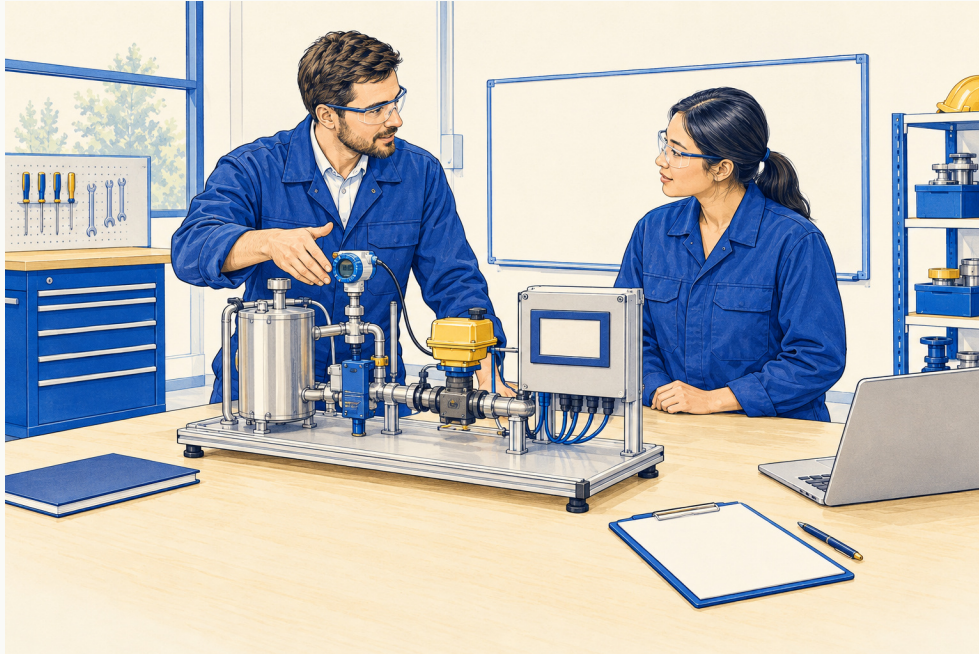
1. Do not turn the register exercise into clause reproduction.
2. Require explicit dates for time-sensitive status statements.

Individual or remote practice

Create separate rows for standard, Rules, supplements and customer requirements before writing a status summary.

Distinguish a feedback controller from statistical monitoring

Identify the elements of a physical feedback loop, calculate a defined error and distinguish controller action from statistical monitoring.



An error of two is not an actuator command

Fictional case: a teaching controller has setpoint 50 and measured value 48 in fictional temperature units. The defined error is setpoint minus measurement, so it is 2. The core loop retains these exact values and the separate disturbance and SPC-monitoring paths. Technician Kai must explain the diagram without prescribing a valve position or PID gain.

Your role and the reference condition

Controls engineer and process learner

Normal: A specified controller compares measured feedback with a reference and applies its authorized control law through an actuator; measurement and disturbances are represented accurately.

Gap: A learner says "error 2 means open the valve 2%" and moves the SPC chart into the fast control loop.

Work within these conditions

1. The numbers are fictional and have no equipment operating meaning.
2. No control law, gain, output scale, safety interlock or tuning procedure is supplied.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Loop-element cards
2. Arrows of two styles
3. Simulation-only value cards

Minutes	Activity and coaching prompt
5	Trace the loop Which arrows carry information and which influence the process?
8	Calculate the defined error What units does the result have?
10	Work the 60/63 case What remains unknown despite correct arithmetic?
5	Debrief sensor fault Why might adjustment worsen the problem?

Debrief

1. Require a visible sensor-return edge.
2. Do not reward a guessed output command as a more complete answer.

Individual or remote practice

Draw both paths first, then annotate only values actually supplied.

Connect calibration to a defensible measurement result

Connect a reported measurement result to its calibration chain, corrections and uncertainty, then separate that evidence from the product acceptance rule.



The sticker does not explain the result

Fictional case: a width result is reported as 10.000 mm with expanded uncertainty 0.020 mm. The core lesson retains those values. Metrology coordinator Ada finds a calibration label on the gauge but the reporting note omits coverage information and the applicable decision rule. A colleague calls the uncertainty an extra tolerance that automatically allows the part to pass.

Your role and the reference condition

Metrology coordinator and product-decision owner

Normal: The measurand, conditions, calibration references, corrections, uncertainty and coverage information support the result; applicable specifications and a decision rule govern conformity assessment.

Gap: A current-looking label is treated as complete traceability, while uncertainty is confused with process specification or an acceptance allowance.

Work within these conditions

1. Traceability is a property of a measurement result supported by a documented calibration chain.
2. The example does not provide a complete uncertainty budget, coverage factor or acceptance rule.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

Help someone else apply the method

Prepare

1. Measurement report and calibration-reference cards
2. Blank decision record
3. Specification card withheld until needed

Minutes	Activity and coaching prompt
5	Define the result What exactly was measured and when?
8	Follow the evidence chain What does the label fail to tell us?
10	Work the near-limit case Which missing rule prevents a justified decision?
5	Debrief fitness Can a traceable result still be unsuitable?

Debrief

1. Do not infer 95% coverage from the word expanded alone.
2. Challenge any arbitrary tolerance enlargement or guard band.

Individual or remote practice

Write the interval calculation and list every assumption separately from the acceptance decision.