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.

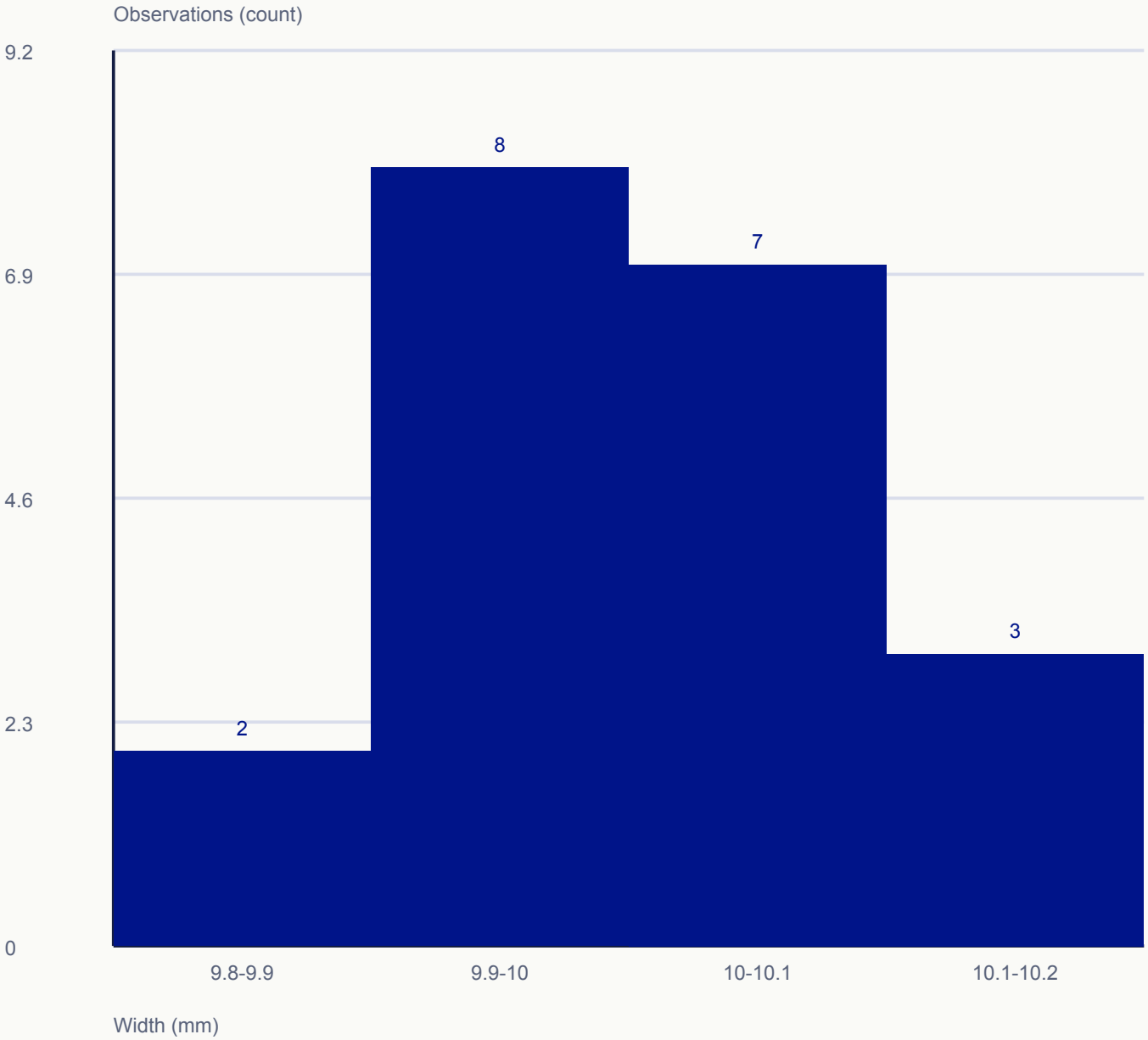
2. A histogram alone cannot establish sequence behavior, process capability or causation.

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

See how the method works

A histogram shows how observations occupy intervals of a measurement scale. Define contiguous bin edges and a rule for boundary values so every observation enters exactly one bin. Inspect shape, gaps and unusual values, while remembering that a histogram discards the sequence in which readings occurred. Two humps may suggest mixed sources, but they do not prove which sources are responsible. Keep the original time and source records for follow-up. A visually narrow distribution is also insufficient to establish stability or capability. Those conclusions require appropriate measurement evidence, temporal analysis and stated specification assumptions.

Frequency within declared bins



Left closed, right open; final bin includes 10.2.

20 synthetic observations; no time order or capability conclusion.

20 synthetic observations; no time order or capability conclusion.

Follow the evidence and decisions

Inspect the supplied case inputs

Bin in mm	Count	Boundary convention
9.80 to below 9.90	2	Include 9.80; exclude 9.90
9.90 to below 10.00	8	Include 9.90; exclude 10.00
10.00 to below 10.10	7	Include 10.00; exclude 10.10
10.10 through 10.20	3	Include both lower edge and final upper endpoint

01 / Define the measurement and scope

Nia names width in millimetres, the observation window and the twenty recorded units. She preserves the raw value and time for every observation before creating bins.

Why: A distribution removes sequence by design. Retaining the source records allows a later check for shifts, mixed streams or measurement issues without inventing missing data.

Evidence / check: Twenty identified measurements remain in the source table.

02 / Write an unambiguous bin rule

She uses left-closed/right-open intervals, with the final upper endpoint included. A reading of 10.00 therefore enters the third bin only.

Why: Adjacent bins require a convention at shared edges. The particular consistent convention is less important than preventing double counts or unassigned boundary values.

Evidence / check: The table explicitly defines the 10.00 and 10.20 assignments.

03 / Reconcile the displayed frequencies

She sums 2 + 8 + 7 + 3 = 20 and compares that total with the raw observation count. She checks the units and equal bin widths before interpreting bar heights.

Why: Missing values or double-assigned boundaries can yield a plausible shape with a false total. Unequal-width histograms need a different height interpretation than this equal-width example.

Evidence / check: All twenty observations are accounted for once.

04 / Describe rather than overclaim

Nia says fifteen observations are in the middle two bins and identifies the observed range covered by the bins. She does not infer normality or stability from twenty grouped values.

Why: Grouping helps reveal distribution shape but hides ordering and individual detail. Several different time patterns can produce exactly the same histogram.

Evidence / check: The report describes this sample distribution with an explicit evidence limit.

05 / Connect the next question to its records

To investigate stability, she retrieves the ordered measurements and operating context. To compare machines, she uses retained source labels rather than interpreting a pooled hump as a machine effect.

Why: The correct next view depends on the question. Repeated rebinning until the shape looks desirable would hide uncertainty instead of resolving it.

Evidence / check: Next analysis names time order or source grouping and the retained evidence it requires.

Completed bin and interpretation record

Check	Completed result	Decision
Count reconciliation	2 + 8 + 7 + 3 =20	No missing or double-counted observations
Boundary 10.00	Third bin only	Apply endpoint convention consistently
Boundary 10.20	Final bin included	Use declared last-bin exception
Middle bins	8 + 7 =15 of 20	Describe sample concentration only
Stability	No time-order display supplied	Retrieve ordered records before assessing behavior

Two sources share the histogram

The records reveal ten observations from each of two machines.

Decision

Keep the pooled distribution but prepare comparable source-separated views using the retained identities. Confirm measurement comparability and exposure before attributing differences.

Reasoning

A pooled shape can conceal different streams. A source label is useful evidence for investigation, not automatic proof that one machine caused the pattern.

What would change the decision?

The analyst can map each observation back to machine and time.

Practise with a changed case

Assign a new small set exactly once

New fictional widths are 9.80,9.90,9.95,10.00,10.05,10.10,10.15 and 10.20 mm. Use the same four bins and endpoint convention.

Bin	Learner task
[9.80,9.90)	Count values
[9.90,10.00)	Count values
[10.00,10.10)	Count values
[10.10,10.20]	Count values

Your task

1. Assign every value and reconcile the total.
2. Explain why 10.10 and 10.20 belong where you place them.
3. Name the records needed before making a stability claim.

Use the next page to record your reasoning before reading the answer.

Your practice worksheet

Assign a new small set exactly once

Assigned values

Bin counts

Total reconciliation

Boundary explanation

Missing sequence evidence

Complete your reasoning before turning to the answer. Use the separate learner workbook for group practice.

Check your reasoning and transfer it

1. Counts are 1,2,2,3, totaling 8. The value 10.10 enters the fourth bin at its included lower edge;10.20 is included by the final-endpoint exception.

2. The same eight values could appear in rising order or alternate high/low. Those sequences have identical bin counts but different time behavior, so retain the original order and context.

Suggested completed record

Bin	Assigned values	Count
First	9.80	1
Second	9.90,9.95	2
Third	10.00,10.05	2
Fourth	10.10,10.15,10.20	3

Plausible wrong turns

1. A histogram does not keep time order.

2. A visually symmetric sample does not prove normality or stability.

Evidence of a sound answer

1. Place all 8 values once.

2. State endpoint convention explicitly.

3. Separate distribution description from a stability conclusion.

Take the learning back to work

Commitment	Agreed follow-through
Owner	Measurement-data owner
Record	Raw ordered values, bin rule and source-linked histogram
Review	At the next distribution review or any bin-rule change
Verification evidence	Reconciled counts and retained time/source identity
If unresolved	Correct collection or binning before comparing shapes; investigate ordering with an appropriate separate view.

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.

Connect the method and check its boundaries

Before application

1. One defined measurement scale
2. Explicit bin-boundary rules

Outside this lesson

1. Time-order stability analysis
2. Capability qualification from twenty values

ASQ: Histogram

ASQ: Histogram

A histogram displays the frequency distribution of numerical observations; bin choices and process context affect interpretation.

Public primary-source summary; underlying paid standards/forms are not reproduced.

Open this lesson and its visual aids