

# Physics, Mathematics and Science Data Quality Checklist - Establish a Reliable Baseline

Physics, Mathematics and Science | Establish a Reliable Baseline | Asset ID TJ-06-04-01

A model is only as reliable as its assumptions and data. Validate units, applicability and uncertainty before using a result outside learning or exploration.

## Purpose and working method

This independent, printable companion helps you make variables, units, models and uncertainty visible in a repeatable solution while working toward one outcome: capture the current state before proposing a change. Use a suitable calculator or utility for computation, then use these pages to preserve meaning, assumptions, checks and decisions. A number alone is not a decision record; a useful record shows where the inputs came from, why the method fits and what would make the result unsafe or misleading.

| Project snapshot     | Record                              |
|----------------------|-------------------------------------|
| Project or question  | _____                               |
| Prepared by / date   | _____                               |
| Decision owner       | _____                               |
| Intended outcome     | Establish a Reliable Baseline       |
| Tool or method used  | Name and version/date: _____        |
| Authoritative source | Title, owner and access date: _____ |
| Review deadline      | _____                               |

## Domain readiness map

| # | Input area              | Current state               | Trace         |
|---|-------------------------|-----------------------------|---------------|
| 1 | Question and hypothesis | Known / estimated / missing | Source: _____ |
| 2 | Known values            | Known / estimated / missing | Source: _____ |
| 3 | Unknown values          | Known / estimated / missing | Source: _____ |
| 4 | Units and scale         | Known / estimated / missing | Source: _____ |
| 5 | Model assumptions       | Known / estimated / missing | Source: _____ |
| 6 | Expected range          | Known / estimated / missing | Source: _____ |

## Data Quality Checklist

This working page applies the data quality checklist format to establish a reliable baseline. Complete it before polishing a conclusion. The useful evidence is dated source values and one representative sample; the governing rule is: do not compare later results unless the baseline conditions are recorded.

| Quality check           | Method                                         | Finding | Action |
|-------------------------|------------------------------------------------|---------|--------|
| Question and hypothesis | test whether the data is fit for this decision | _____   | _____  |
| Known values            | test whether the data is fit for this decision | _____   | _____  |
| Unknown values          | test whether the data is fit for this decision | _____   | _____  |
| Units and scale         | test whether the data is fit for this decision | _____   | _____  |
| Model assumptions       | test whether the data is fit for this decision | _____   | _____  |
| Expected range          | test whether the data is fit for this decision | _____   | _____  |

### Completion standard

- Write real units, dates and source owners; avoid labels such as normal, typical or standard without a definition.
- Mark estimates as estimates. Record a range when a single value would imply false precision.
- Keep an untouched copy of source data and give every working version a date or revision.
- Record contrary evidence. A workbook that only supports the preferred answer is not a reliable check.
- Remove personal, confidential or security-sensitive details that are unnecessary for the decision.

## Input and Data Map

**Privacy gate: minimise personal, confidential and security-sensitive information. If a value can identify a person, account, location or protected system, use an approved environment and retention rule.**

| # | Data element            | Minimum validation       | Source       | Status      |
|---|-------------------------|--------------------------|--------------|-------------|
| 1 | Question and hypothesis | identity and date        | Owner: _____ | Ready / gap |
| 2 | Known values            | definition and unit      | Owner: _____ | Ready / gap |
| 3 | Unknown values          | range and precision      | Owner: _____ | Ready / gap |
| 4 | Units and scale         | missing-value rule       | Owner: _____ | Ready / gap |
| 5 | Model assumptions       | consistency with peers   | Owner: _____ | Ready / gap |
| 6 | Expected range          | fitness for the decision | Owner: _____ | Ready / gap |

## Transformation trail

| Stage       | Question                                       | Record                    |
|-------------|------------------------------------------------|---------------------------|
| Raw input   | What arrived before cleaning or conversion?    | Location / version: _____ |
| Cleaning    | What was removed, repaired or standardised?    | Rule: _____               |
| Conversion  | Which units, formats or scales changed?        | Before / after: _____     |
| Derivation  | Which values were calculated from others?      | Method: _____             |
| Exclusion   | Which records or conditions were left out?     | Reason: _____             |
| Final input | What exact dataset or values entered the tool? | Hash / version: _____     |

## Spot-check sample

| Sample | Original      | Working value   | Comparison        | Decision         |
|--------|---------------|-----------------|-------------------|------------------|
| 1      | Source: _____ | Prepared: _____ | Difference: _____ | Accept / correct |
| 2      | Source: _____ | Prepared: _____ | Difference: _____ | Accept / correct |
| 3      | Source: _____ | Prepared: _____ | Difference: _____ | Accept / correct |
| 4      | Source: _____ | Prepared: _____ | Difference: _____ | Accept / correct |

## Establish a Reliable Baseline Action Workbook

Use this page to capture the current state before proposing a change. The aim is not to fill every blank; it is to expose the few facts that could change the decision. The evidence package should contain dated source values and one representative sample.

| Action field        | Prompt                                        | Record |
|---------------------|-----------------------------------------------|--------|
| Decision to support | What choice or action will this work inform?  | _____  |
| Audience            | Who must understand or approve it?            | _____  |
| Success measure     | What observable result would count as useful? | _____  |
| Decision date       | When is evidence needed, and why then?        | _____  |
| Critical assumption | Which belief could reverse the conclusion?    | _____  |
| Missing evidence    | What is the most important current gap?       | _____  |
| Stop condition      | What result requires pause or escalation?     | _____  |

## Outcome-specific plan

| Step         | Required action                                                          | Record                  |
|--------------|--------------------------------------------------------------------------|-------------------------|
| 1. Frame     | Restate establish a reliable baseline as a question                      | Owner / due: _____      |
| 2. Gather    | Collect dated source values and one representative sample                | Owner / due: _____      |
| 3. Calculate | Use inputs from question and hypothesis and known values                 | Method / version: _____ |
| 4. Challenge | Test model assumptions and expected range                                | Reviewer: _____         |
| 5. Decide    | Do not compare later results unless the baseline conditions are recorded | Decision: _____         |

## One-sentence brief

We need to decide \_\_\_\_\_ by \_\_\_\_\_. The current evidence suggests \_\_\_\_\_, but the decision could change if \_\_\_\_\_. The next owner is \_\_\_\_\_.

## Assumption and Source Register

**Source gate: an online result is not automatically authoritative. Record the original owner, document or dataset, publication or revision date, access date and the exact field used. Recheck time-sensitive values before publication or commitment.**

| ID | Item                    | Evidence class               | Trace         | Decision impact  |
|----|-------------------------|------------------------------|---------------|------------------|
| A1 | Question and hypothesis | Fact / estimate / assumption | Source: _____ | Low / med / high |
| A2 | Known values            | Fact / estimate / assumption | Source: _____ | Low / med / high |
| A3 | Unknown values          | Fact / estimate / assumption | Source: _____ | Low / med / high |
| A4 | Units and scale         | Fact / estimate / assumption | Source: _____ | Low / med / high |
| A5 | Model assumptions       | Fact / estimate / assumption | Source: _____ | Low / med / high |
| A6 | Expected range          | Fact / estimate / assumption | Source: _____ | Low / med / high |

## Units, dates and versions

| Control           | Review question                               | Record            |
|-------------------|-----------------------------------------------|-------------------|
| Units             | Are symbols and conversion factors explicit?  | Checked by: _____ |
| Time basis        | Instant, daily, monthly, annual or lifecycle? | Basis: _____      |
| Currency / locale | Currency, tax location and rounding rule?     | Basis: _____      |
| Version           | Which tool, formula, policy or data revision? | Version: _____    |
| Applicability     | Why does the method fit this case?            | Reason: _____     |
| Exclusions        | What important factor is outside the model?   | Record: _____     |

## Assumption challenge

- What direct evidence would replace the largest assumption?
- Which assumption is both uncertain and capable of changing the decision?
- Would an independent person interpret every field the same way?
- Has a current authoritative source been checked for rates, limits, laws, standards or safety boundaries?
- Who is qualified to approve this use of the result?

## Scenario Comparison Matrix

Scenario work reveals whether establish a reliable baseline stays stable or depends on a narrow assumption. Change a driver deliberately, retain the same definitions and explain why each value is credible. Do not label an optimistic case as expected simply because it is preferred.

| Driver                  | Low / adverse       | Working case    | High / favourable | Reason        |
|-------------------------|---------------------|-----------------|-------------------|---------------|
| Question and hypothesis | Conservative: _____ | Expected: _____ | Stretch: _____    | Source: _____ |
| Known values            | Conservative: _____ | Expected: _____ | Stretch: _____    | Source: _____ |
| Unknown values          | Conservative: _____ | Expected: _____ | Stretch: _____    | Source: _____ |
| Units and scale         | Conservative: _____ | Expected: _____ | Stretch: _____    | Source: _____ |
| Model assumptions       | Conservative: _____ | Expected: _____ | Stretch: _____    | Source: _____ |
| Expected range          | Conservative: _____ | Expected: _____ | Stretch: _____    | Source: _____ |

## Outcome comparison

| Comparison                    | Conservative        | Expected            | Stretch             |
|-------------------------------|---------------------|---------------------|---------------------|
| Calculated result             | _____               | _____               | _____               |
| Time implication              | _____               | _____               | _____               |
| Cost or resource implication  | _____               | _____               | _____               |
| Quality or performance effect | _____               | _____               | _____               |
| Risk and reversibility        | _____               | _____               | _____               |
| Evidence confidence           | Low / medium / high | Low / medium / high | Low / medium / high |

## Sensitivity note

The conclusion changes most when \_\_\_\_\_ moves from \_\_\_\_\_ to \_\_\_\_\_. That driver is supported by \_\_\_\_\_. Before commitment, we will \_\_\_\_\_.

## Verification and Decision Gate

**High-stakes gate:** A model is only as reliable as its assumptions and data. Validate units, applicability and uncertainty before using a result outside learning or exploration. For any consequential use, a qualified professional must verify the current authoritative source, inputs, method and limits. A completed workbook does not grant legal, financial, medical, engineering, laboratory, security, operational or safety approval.

| Gate               | Acceptance condition                                   | Status     | Evidence |
|--------------------|--------------------------------------------------------|------------|----------|
| Input trace        | Every critical value has a source, date and unit       | Pass / gap | _____    |
| Independent check  | A second method or reviewer could expose an error      | Pass / gap | _____    |
| Applicability      | The method fits the case and stated boundary           | Pass / gap | _____    |
| Range              | A plausible low and high case has been tested          | Pass / gap | _____    |
| Contrary evidence  | Conflicts are recorded and explained                   | Pass / gap | _____    |
| Privacy and rights | Sensitive and third-party material is controlled       | Pass / gap | _____    |
| Qualified review   | Required professional or authorised review is complete | Pass / gap | _____    |

## Decision record

| Decision field     | Choice                                  | Record           |
|--------------------|-----------------------------------------|------------------|
| Recommendation     | Proceed / revise / pause / reject       | Reason: _____    |
| Confidence         | Low / medium / high                     | Evidence: _____  |
| Conditions         | What must stay true?                    | Record: _____    |
| Reversal trigger   | What new evidence reopens the decision? | Record: _____    |
| Owner and approval | Who owns the decision and its limits?   | Name/date: _____ |

## Final rule

For establish a reliable baseline, do not compare later results unless the baseline conditions are recorded. Record the decision separately from the calculation so a later reviewer can distinguish evidence, interpretation, approval and action.

## Handover, Reuse and Follow-Up

Close the record so another person can reproduce the work, understand the limits and continue establish a reliable baseline without relying on memory. Keep the smallest useful evidence package, protect sensitive information and give the final file a clear version.

| Handover field      | Record                             |
|---------------------|------------------------------------|
| Current conclusion  | _____                              |
| Evidence location   | Folder, record or reference: _____ |
| Open question       | _____                              |
| Decision condition  | _____                              |
| Next action / owner | _____                              |
| Review date         | _____                              |
| Retention / privacy | Keep until _____; access: _____    |

## Reuse checklist

| Reuse gate  | Question                                                                | Status       |
|-------------|-------------------------------------------------------------------------|--------------|
| Definitions | Are the meanings of question and hypothesis and known values unchanged? | Yes / update |
| Sources     | Are rates, limits, data and guidance still current?                     | Yes / update |
| Context     | Does the new case share the same scope and conditions?                  | Yes / update |
| Method      | Is the chosen tool or method still applicable?                          | Yes / update |
| Review      | Has the right qualified or authorised person checked it?                | Yes / update |
| Version     | Has the reused record received a new date and identifier?               | Yes / update |

## 30-day learning loop

- Compare the expected result with what actually happened.
- Record whether an assumption, input definition or method caused avoidable rework.
- Improve one shared field or check; do not add process that supports no decision.
- Archive the final decision, not every unnecessary draft.

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