

# Physics, Mathematics and Science Input Preparation Workbook - Track Change Over Time

Physics, Mathematics and Science | Track Change Over Time | Asset ID TJ-06-01-08

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: build a consistent series that reveals direction and exceptions. 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     | Track Change Over Time              |
| 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: _____ |

## Input Preparation Workbook

This working page applies the input preparation workbook format to track change over time. Complete it before polishing a conclusion. The useful evidence is same measure, cadence, conditions and owner; the governing rule is: investigate changes in method before interpreting changes in outcome.

| Input field             | Definition and unit                       | Source and date | Status |
|-------------------------|-------------------------------------------|-----------------|--------|
| Question and hypothesis | define the field before recording a value | _____           | _____  |
| Known values            | define the field before recording a value | _____           | _____  |
| Unknown values          | define the field before recording a value | _____           | _____  |
| Units and scale         | define the field before recording a value | _____           | _____  |
| Model assumptions       | define the field before recording a value | _____           | _____  |
| Expected range          | define the field before recording a value | _____           | _____  |

### 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 |

## Track Change Over Time Action Workbook

Use this page to build a consistent series that reveals direction and exceptions. 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 same measure, cadence, conditions and owner.

| 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 track change over time as a question                         | Owner / due: _____      |
| 2. Gather    | Collect same measure, cadence, conditions and owner                  | 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    | Investigate changes in method before interpreting changes in outcome | 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 track change over time 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 track change over time, investigate changes in method before interpreting changes in outcome. 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 track change over time 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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