Research Calculator: user guide

For Word and Excel · Version 1.3 (beta) · November 2026

Research Calculator checks the equations, statistics, calculations and reference lists in manuscripts, reports, grant proposals and theses. In Excel it also checks spreadsheets for formula mistakes and impossible values, and adds research tools, cell functions and R. Every check is a transparent calculation that runs on your computer, with the working shown and the papers it is based on. **No AI, you verify.**

1. Install

- **From Microsoft's add-in store:** in Word or Excel, go to **Home → Add-ins**, search for *Research Calculator* and press **Add**.
- **Manual install (before store approval):** download *manifest.xml* from **rafiki.earth/install-addin.html** and follow the steps there for Word or Excel on the web, Mac or Windows. The same file installs the add-in in both Word and Excel.

If you installed an earlier version (Calculation Spellchecker, or Check a result for Word or Excel), remove it first. You only install once: the add-in loads from rafiki.earth, so new checks and fixes appear the next time you open it.

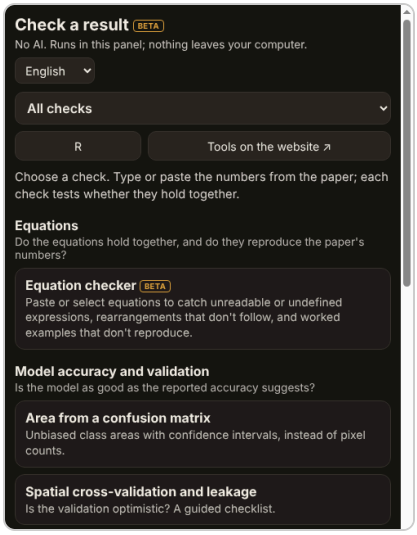
2. In Word

The add-in adds two buttons to Word's **Home** tab, in the **Rafiki Earth** group:

- **Compute**: the plausibility checks and the equation checker.
- **References**: the reference list checks (section 5).

Each opens its own panel on the right. In Compute:

- **Language:** the menu at the top switches between English, Kiswahili and Spanish.
- **Choose a check:** pick one from the list, or from the cards on the home screen. **← All checks** takes you back.
- **R** runs R on the tables in your document.
- **Tools on the website ↗** opens the full tools at rafiki.earth.



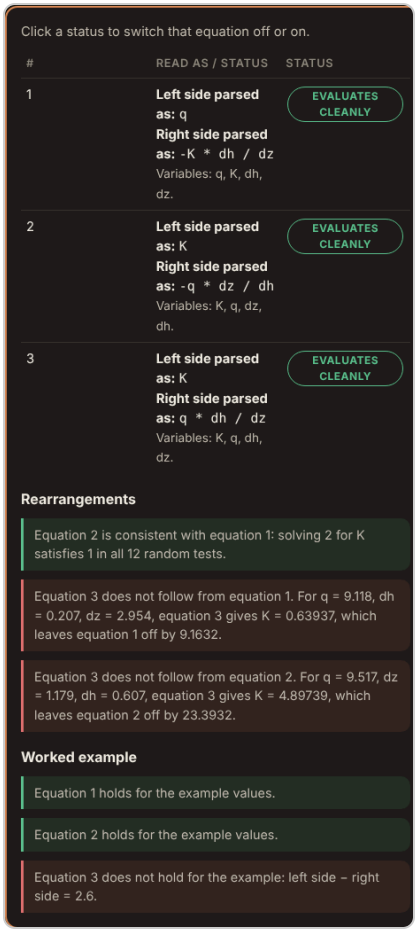
Compute: the list of checks

3. The equation checker

1. **Selected equations:** select them in your document and press **Check the selected equations**.
2. **Every equation:** press **Find all equations in the document**. Click a row in the results to jump to that equation.
3. **Comments:** press **Add the findings as a comment** to attach the results to the document.

4. **Without a document:** type or paste equations into the box, one per line. Numbers such as "(3)" are ignored, and a line starting with # is switched off. Add a worked example from the paper (for example *q = 0.5, dz = 10, dh = -2*) to check that its numbers reproduce. Lists and matrices are written *x = [1, 2, 3]* or *A = [2, -1; -1, 2]*.
5. **Variables are Positive or Any sign:** sets the values the equations are tested at.

Each equation gets a status; click a status to switch that equation off or on. The checker reports equations it cannot read, rearrangements that do not follow from an earlier equation, and worked examples that do not reproduce.



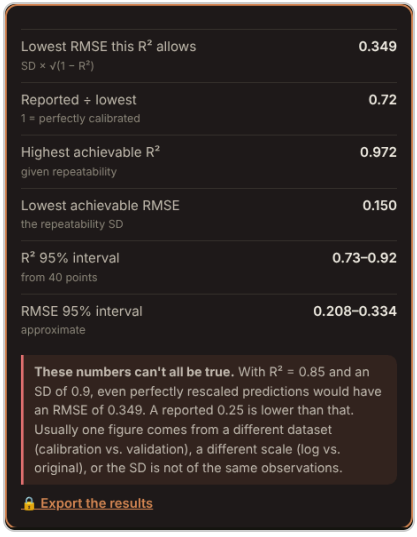
Equation 3 is a wrong rearrangement of equation 1

4. The plausibility checks

1. Choose a check and type or paste the values from the document into the boxes.
2. Results appear as you type. Checks with heavier calculations have a **Check**, **Calculate** or **Evaluate** button.
3. **Example** fills in values from a worked example; **Start over** clears the form.
4. **Show the working** lists every step of the calculation; the references are at the bottom of each check.

The checks:

- **Equations:** Equation checker.
- **Model accuracy and validation:** Area from a confusion matrix, Spatial cross-validation and leakage, Model evaluation and PICP, R^2, RMSE and SD, Agreement metrics, Classification accuracy.



R^2, RMSE and SD with its worked example

- **Spatial structure and sampling:** Effective sample size, Finding the right pixel size, Kriging error vs. the variogram, Samples for a map (from the variogram), Can the change be detected?
- **Soil data and units:** Carbon stock arithmetic, Back-transformation, Lab method conversions, Coordinates and distances.
- **Study design and statistical reasoning:** Independence and study design, Statistical assumptions check, Model comparison audit, F tests and degrees of freedom.

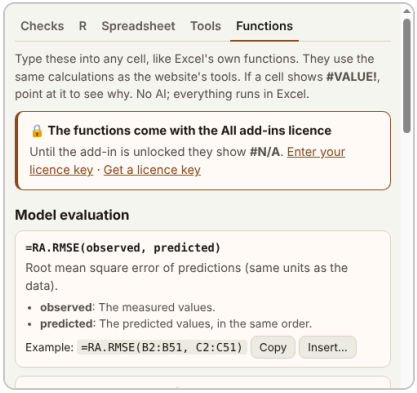
5. References (Word)

Press **References** on the Home tab. The panel finds the reference list in your document and splits it into entries by indentation, numbers or bullets, as Soma does. DOIs and web addresses become links. **Read the document again** picks up changes.

- **Reference list** shows the list as written in the document.
- **Full review** checks the reference list against the citations in the text.
- **Analysis** and **Export** are the other two tabs.
- **Reference style** shows the list as written (Original), or in APA, Harvard, Chicago or Vancouver.

6. In Excel

On Excel's **Home** tab, **Compute** and **Tools** open the panel. Its tabs are:



The Functions tab in Excel

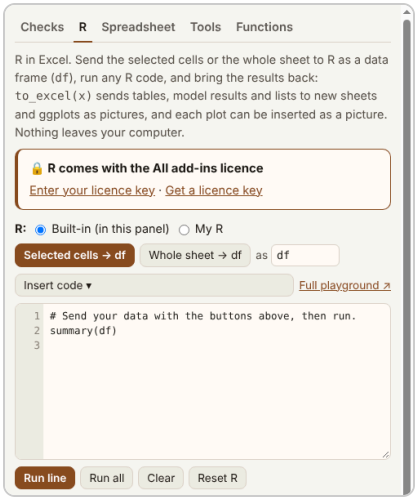
- **Checks:** the same checks as in Word, reading values from your selected cells.
- **R:** R in Excel (section 7).
- **Spreadsheet:** formula mistakes and impossible values. It finds formulas that differ from their column, ranges that miss rows or count a total twice, numbers stored as text, codes turned into dates, duplicate IDs, and values no measurement can have (pH 15, bulk density 3.1, latitude 128). Each finding says why. **Check the selected cells** or **Check the whole workbook**; nothing in the workbook changes unless you ask.
- **Tools:** the website's tools, from the profile harmoniser to evapotranspiration and Munsell colour. Select your data with its header row and click **Use the selected cells**; results go to a new sheet.
- **Functions:** cell functions you type like Excel's own, such as `=RA.RMSE()`, `=RA.CCC()`, `=RA.CARBONSTOCK()`, `=RA.TEXTURE()`, `=RA.SPLINE()` and `=RA.ET0_HARGREAVES()`. The tab lists every function with an example to copy or insert. If a cell shows #VALUE!, point at it to see why.

7. R

The **R** tab sends the selected cells, or the whole sheet, to R as a data frame called `df`. Run any R code on it. `to_excel(x)` writes tables, model results and lists to new sheets, and each plot opens in a window where you can resize it, redraw it at a higher resolution, copy it, save it as a PNG or insert it in the sheet. R runs in two ways:

- **Built-in:** R runs inside the panel, so nothing needs installing. The first run takes a little while to load R, and packages such as ggplot2 download the first time you use them.
- **My R:** the panel runs its code in your own R, with your packages, functions and workspace. In R or RStudio, run `source("https://rafiki.earth/excel/rafikiearth-connect.R")`, then in the R tab choose **My R**, enter the code it shows and press **Connect**. The link only listens on your own computer.

Full playground ↗ opens the R playground on the website. Full steps are at rafiki.earth/install-addin.html.



The R tab in Excel

8. Free and paid features

Free: the full equation checker, every check with values you type or paste, and the reference list as written. Features marked 🔒 need a licence key:

Plan	Price	Unlocks
Word	$10 a year	Reading values from the document, comments and exporting results on the checks; in References, the full review, analysis, export, reference styles, jumping to entries and comments.
Excel	$10 a year	Reading values from your selected cells, Check the whole workbook, cell comments, writing results to a sheet, the spreadsheet checks, the tools, the `=RA.` cell functions and R.
All	$20 a year	Word and Excel, PowerPoint when it is released, and the Soma and Asili apps.

The add-in plans include a 7-day free trial. Members get $5 off any plan, so All is $15 a year; contributors get everything free. Buy a key at rafiki.earth/membership.html; members also find their keys on their account page. To unlock, open the add-in (in Excel, the **Checks** tab), click **Unlock** at the bottom of the panel, paste your key and press **Unlock**. Subscriptions renew each year; cancel any time.

9. Privacy

Everything runs on your computer. Nothing you select, type or paste is sent to Rafiki Earth or anyone else. If you unlock the add-in, only your licence key is checked. In the R tab, the built-in R downloads R and its packages, but your data stays in the panel; with My R, your data goes only to the R on your own computer. No account is needed to use the free features, and the add-in contains no AI, tracking or advertising. Privacy policy: rafiki.earth/privacy.html.

10. Help

Email admin@rafiki.earth, or see rafiki.earth/install-addin.html.

How to cite: Flynn, T. (2026). *Research Calculator: Word and Excel add-ins* [Office add-in]. Rafiki Earth. https://doi.org/10.5281/zenodo.24446121