

Outliers Need Investigation Not Automatic Deletion

A flagged outlier is a starting point for investigation, not an automatic instruction to delete a data point. This page explains how to investigate one responsibly.



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What this answers

This page answers "a calculator flagged an outlier, now what?" An outlier flag, whether from an IQR fence, a Grubbs test, or a regression influence measure, identifies a value that is unusual relative to the rest of your data. It does not tell you whether that value is an error, a rare but real observation, or the most important data point in your entire set.

How outliers are flagged

An IQR fence flags any value more than 1.5 times the interquartile range beyond the first or third quartile, a simple, distribution-free rule of thumb. Grubbs' test formally tests whether the most extreme value is statistically inconsistent with a normal distribution. In regression, Cook's distance and leverage measure how much a single point changes the fitted model if removed, which is a different question from whether the point itself looks unusual on its own.

Investigate before you decide

Start by checking the value for a data entry or measurement error: a misplaced decimal point, an impossible value for the variable's actual range, or a recording unit mismatch are common and legitimate reasons to correct or remove a point. If no error is found, consider whether the value represents a genuinely different population or process, such as a different measurement device or an unusual but real event, which may call for a separate analysis rather than deletion. If the value appears to be a rare but valid observation from the same process you are studying, it usually belongs in the analysis.

Sensitivity analysis and documentation

When a flagged point's status stays genuinely uncertain, report the result both with and without it, so a reader can see how much the conclusion depends on that single observation. Document every removal decision with its specific reason; a result that changes qualitatively depending on one point's inclusion deserves that transparency regardless of which choice you make.

Worked example

A dataset of delivery times has values 3, 4, 5, 4, 6, and 45 days. The IQR fence flags 45 as an outlier. Investigating the source log shows the 45-day delivery was delayed by a shipping carrier strike, an unusual but real event rather than a data error. Reporting the mean both with and without that observation, and noting the cause, gives a reader an honest picture instead of a single number that hides the decision.

Assumption audit

Calculated from your data: the IQR fence boundaries, the Grubbs test statistic, or the Cook's distance and leverage values, once you run the relevant engine on your data.

Evidence to review: a box plot or the raw value in context, to see how far the flagged point sits from the rest of your data.

You must verify: the actual source and cause of the flagged value, since no statistical rule can distinguish a data-entry error from a rare but genuine observation without that outside knowledge.

Source

This guidance follows the outlier-handling recommendations in the NIST/SEMATECH e-Handbook of Statistical Methods and the shared statistical reasoning contract every StatReason engine is built against.

Limitations

This page describes a general investigation process; it does not recommend a universal rule for when to delete a point, since that decision depends on domain knowledge no statistical rule

can supply.

Next action: flag candidates with the [Outlier Calculator](#) or [Grubbs Test](#), or check influence in a regression with [Cook's Distance Calculator](#).