The Bridge Is the Bridge: abc

The same bridge, three crossings: Riemann, BSD, and abc

A note on architecture, with a pointer to a published measurement.

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Three of the hardest open problems in mathematics are usually stated in three different languages. Stated in one language, they are the same shape.

Each concerns a single object that can be read in two ways. Each conjecture is, at its core, the claim that the two readings agree — that what is present at one end arrives at the other. The bridge between the readings is not a mechanism and does no work. It is the space the property crosses; everything happens at the ends.

Riemann. The zeta function can be read through its zeros or through the primes. The explicit formula is a conversion table between the two readings — exact, and already known. The Riemann Hypothesis is the claim that the conversion has no drift: every zero lies on the one line where the two readings stay in perfect step.

BSD. The L-function of an elliptic curve, at its center, can be read analytically — its zeros and leading coefficient — or algebraically — the rank and the arithmetic invariants of the curve. The Birch and Swinnerton-Dyer conjecture is the claim that these are two readings of one property: the same quantity, spoken in two dialects.

abc. A triple a + b = c, with nothing shared between the parts, can be read additively, by the size of the sum, or multiplicatively, by the product of its distinct primes. The abc conjecture is the claim that the first reading never outruns the second by more than a margin that itself gives out: for any ε > 0, only finitely many triples stand with c larger than rad(abc)^(1+ε). Here the claimed agreement is not exact but bounded — the loosest of the three bridges, and still unbuilt.

The lay picture is a thermometer. Fahrenheit and Celsius are two scales for one heat: an exact conversion, neither scale the true one. The scales coincide at exactly one point, −40, and differ everywhere else while never disagreeing. For Riemann and for BSD, the claimed agreement is of this exact kind. For abc the claim is weaker — agreement within a vanishing margin — but the architecture is the same: one quantity, two readings, and a comparison that mathematics cannot yet make lawful in general.

What this note is. An observation about architecture, nothing more. It proves no conjecture, and it claims no new result about any of the three problems. Where one such comparison has been carried out as measurement rather than assertion, we point to it: our consolidated record, “One Property, Two Readings — A Pre-Registered Attempt to Separate BSD and Riemann,” published today (Zenodo, DOI 10.5281/zenodo.24041813), in which the two readings were tabulated side by side on 85 elliptic curves and the numbers — 650 of them, named and exact — stand public with their checking scripts beside them.

Why publish a framing at all. The three fields cannot currently read one another’s statements without translation, and a shared sentence is a scientific instrument. If this frame is wrong, it is wrong in one page, where anyone can point at the joint. If it is right, the work is there for whoever wants to do it.

The bridge is the bridge.

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