Motivic Symbols and Classical Multiplicative Functions

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Number theory is a field where you study integers and the way they relate to each other. We look at a section of number theory called multiplicative functions. These functions act as machines that tells you some fixed property of the number you give them. Ex.: The square indicator function tells you whether a number is a square number. Up until now, this section of number theory has been fairly messy, with thousands of facts - and their proofs - lacking an organized framework. When we started to study these functions, we looked at the function “outputs” at different primes and powers of primes, and put it into a neat table for each function. We realized that each such table could represent its function. We wanted to make this concrete representation simpler, while keeping essential information about the function. What we ended up with was Motivic Symbols: they look much like fractions and have operations as simple as addition and division. Using them, hundreds of proofs can be reduced from stretching over many pages to just one or two lines.

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