NON-ORDINARY PRIMES: A STORY

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ABSTRACT. A normalized modular eigenform f is said to be *ordinary* at a prime p if p does not divide the p-th Fourier coefficient of f. We take f to be a modular form of level 1 and weight $k \in \{12, 16, 18, 20, 22, 26\}$ and search for primes where f is not ordinary. To do this, we need an efficient way to compute the reduction modulo p of the p-th Fourier coefficient. A convenient formula was known for $k = 12$; trying to understand it leads to generalized Rankin–Cohen brackets and thence to formulas that we can use to look for non-ordinary primes. We do this for $p \leq 1\,000\,000$.