JUMPING CHAMPIONS

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Abstract. The asymptotic frequency with which pairs of primes below x differ by some fixed integer is understood heuristically, although not rigorously, through the Hardy–Littlewood k-tuple conjecture. Less is known about the differences of consecutive primes. For all x between 1000 and 10^{12}, the most common difference between consecutive primes is 6. We present heuristic and empirical evidence that 6 continues as the most common difference (jumping champion) up to about $x = 1.7427 \cdot 10^{35}$, where it is replaced by 30. In turn, 30 is eventually displaced by 210, which is then displaced by 2310, and so on. Our heuristic arguments are based on a quantitative form of the Hardy–Littlewood conjecture. The technical difficulties in dealing with consecutive primes are formidable enough that even that strong conjecture does not suffice to produce a rigorous proof about the behavior of jumping champions.