

**Title:** "42"

**Abstract:** In 1992 Ghosh and I conjectured that

$$\int_0^T |\zeta(1/2 + it)|^6 dt \sim 42 \prod_p (1 - 1/p)^4 (1 + 4/p + 1/p^2) T (\log T)^9 / 9!$$

The 42 in the conjecture was later identified by random matrix theorists as a factor that occurs in the sixth moment of the characteristic polynomials of unitary matrices; this realization began a lot of work connecting the value distribution of L-functions and characteristic polynomials.

No progress has been made towards the sixth moment of  $\zeta$  but in joint work with Iwaniec and Soundararajan we have proven an asymptotic formula for the sixth moment of  $|L(1/2 + it, \chi)|$  when averaged over a suitable set of  $\chi$ ,  $q$  and  $t$ . Our formula has the same 42 that appears in the sixth moment conjecture for  $\zeta$ . Our technique is based on what we call the "asymptotic large sieve".