# THE JOHN RIORDAN PRIZE

In 2015 the OEIS is offering a prize of \$1000 for
the best solution to an open problem in the OEIS.

The On-Line Encyclopedia of Integer Sequences invites you to solve an open problem in an entry in the OEIS (https://oeis.org). After adding your solution to the OEIS entry, notify secretary@oeisf.org with subject line "Riordan Prize Nomination". (It is perfectly acceptable to nominate your own work.) The deadline for submission is December 1, 2015. The decision will be made by a special prize committee, and will be announced at the Joint Mathematics Meetings in Seattle in January 2016.

To find problems to work on, search in the OEIS for the words "conjecture", "empirical", "evidence suggests", "it would be nice", "would like", etc. Or find a formula or recurrence (with proof, of course) for a sequence that currently has no formula.

The prize is named after John Riordan (1903-1988; Bell Labs, 1926-1968), author of the classic books *An Introduction to Combinatorial Analysis* (1958) and *Combinatorial Identities* (1968), which were the source for hundreds of early entries in the OEIS.

Here is an example from 2008: Sequence A145855 gives the number of $n$-element subsets of $\{1, ..., n\}$ whose sum is a multiple of $n$ $(1, 1, 4, 9, 26, 76, 246, \ldots$ for $n \geq 1)$. Vladeta Jovovic conjectured that the $n$th term is $\frac{1}{2n}\sum_{d|n}(-1)^{n+d}\phi(\frac{n}{d})\binom{2d}{d}$, and Max Alekseyev found a proof. (This is not a candidate for the prize, since only work carried out in 2015 is eligible.)

The following is a recent unsolved problem, a conjecture of Alois P. Heinz (see A216368). Consider the number of values taken by the $n$th derivative of $x \uparrow x \uparrow \ldots \uparrow x$ (with $n$ $x$'s and parentheses inserted in all possible ways, where the up-arrows indicate exponentiation), evaluated at $x = 1$. Show that this is given by $1, 1, 2, 4, 9, 20, \ldots$, the number of rooted trees on $n$ nodes (A000081).

Your proof should be mentioned in the appropriate OEIS entry, but (especially if it is long) may be published elsewhere, for example on the arXiv.

Additional information may be found here: https://oeis.org/wiki/RiordanPrize.

We hope that this competition will lead to the resolution of many open questions in the OEIS!

Neil J. A. Sloane
President
The OEIS Foundation
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