Problem 8. The increasing sequence

1, 7, 8, 49, 50, 56, 57, 343, 344, . . .

consists of exactly those positive integers that are powers of 7 (such as $7^0 = 1$ and $7^3 = 343$) and those that are a sum of unique powers of 7 (such as $56 = 7^2 + 7^1$ or $393 = 7^3 + 7^2 + 7^0$, but not $14 = 7^1 + 7^1$). Find the 2015$^{\text{th}}$ entry in this list.

Solutions due by 10:00am Monday, October 19.