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# Highly powerful number

In elementary number theory, a **highly powerful number** is a positive integer that satisfies a property introduced by the Indo-Canadian mathematician Mathukumalli V. Subbarao.[1] The set of highly powerful numbers is a proper subset of the set of powerful numbers.

Define **prodex**(1) = 1. Let $n$ be a positive integer, such that $n = \prod_{i=1}^{k} p_i^{e_{p_i}(n)}$, where $p_1, \ldots, p_k$ are $k$ distinct primes in increasing order and $e_{p_i}(n)$ is a positive integer for $i = 1, \ldots, k$. Define $\mathbf{prodex}(n) = \prod_{i=1}^{k} e_{p_i}(n)$. (sequence A005361 in the OEIS) The positive integer $n$ is defined to be a **highly powerful number** if and only if, for every positive integer $m,\ 1 \leq m < n$ implies that $\mathbf{prodex}(m) < \mathbf{prodex}(n)$.[2]

The first 25 highly powerful numbers are: 1, 4, 8, 16, 32, 64, 128, 144, 216, 288, 432, 864, 1296, 1728, 2592, 3456, 5184, 7776, 10368, 15552, 20736, 31104, 41472, 62208, 86400. (sequence A005934 in the OEIS)

## References


1. Hardy, G. E.; Subbarao, M. V. (1983). "Highly powerful numbers". *Congr. Numer. 37*. pp. 277–307.
2. Lacampagne, C. B.; Selfridge, J. L. (June 1984). "Large highly powerful numbers are cubeful" (https://doi.org/10.1090%2Fs0002-9939-1984-0740165-6). *Proceedings of the American Mathematical Society*. **91** (2): 173–181. doi:10.1090/s0002-9939-1984-0740165-6 (https://doi.org/10.1090%2Fs0002-9939-1984-0740165-6).