assume $n = \sum_{i=0}^{m} k^i$, fix m, $k = \lfloor n^{1/m} \rfloor$. enumerate m, assume computing $pow()$ is $O(1)$, for each k we need $O(1)$ to verify by sum of geometric sequence. Let t be a parameter, enumerate $1 \leq k \leq t$, then enumerate $1 \leq m \leq \log_t W$. let $t = \frac{\log W}{\log \log W}$, time $O(t + \log_t W) = O(\frac{\log W}{\log \log W})$.

References