Let $A$ be an $n$-bit number with most significant bit of $A = 1$. Goal: select a random number in $[0, A)$.

Consider the following algorithm that given $A$ (so that $A$ is not a power of 2) it performs the
following steps:

1. $n := \lceil \log_2 A \rceil$.
2. repeat $v$ times:
3. choose: $x_0, x_1, \ldots, x_{n-1} \leftarrow_R \{0, 1\}$.
4. $y := \sum_{\ell = 0}^{n-1} 2^\ell x_\ell$.
5. if $y < A$ output $y$ and halt.
6. output 0.

Investigate the output probability distribution of the above algorithm with respect to the above goal.