Consider the following samplers that given $A$ (so that $A$ is not a power of 2, $n$-bit number with most significant bit of $A = 1$) they perform the following steps to select a number in range $[0, A)$:

**Sampler 1:**
1. $n := \lceil \log_2 A \rceil$.
2. choose: $x_0, x_1, \ldots, x_{n-1} \leftarrow_R \{0, 1\}$.
3. $y := \sum_{\ell=0}^{n-1} 2^\ell x_\ell$.
4. output $y \mod A$.

**Sampler 2:**
1. choose: $x_0, x_1, \ldots, x_{A-1} \leftarrow_R \{0, 1\}$.
2. $y := \sum_{\ell=0}^{A-1} x_\ell$.
3. output $y$.

**Sampler 3:**
1. $n := \lceil \log_2 A \rceil$.
2. repeat
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. else repeat.

Measure the quality of each sampler by computing the statistical distance of the output distribution of sampler to the uniform distribution over set $\{0, 1, 2, \ldots, A-1\}$. The statistical distance should be expressed as a function in $n$ and possibly $A$. Moreover, you should identify range of values for $A$ for which the sampler behaves more favorably. You should also consider the quality of the sampler in the asymptotic sense: how does it scale as $n$ becomes larger? Finally you should take into account the number of coins used by each sampler; if coins are a scarce resource, which one is the best sampler? how do the samplers compare in this case?