Question #1 [ranks 4]. Simulate the behavior of the algorithm MultiKey-Quicksort on the following array of 5 strings $S=\{\text{bus, bath, abacus, aargh, cat}\}$, by assuming that the pivot string is always the first one of the recursive set of strings.

Question #2 [ranks 5]. Given the integer sequence $S = (1, 2, 3, 4, 6, 8, 9)$, show how Interpolative Coding compresses the “first three” integers according to its algorithm.

Question #3 [ranks 4]. Let us given the probabilities: $p(a) = 1/2$, $p(b)=p(c)=1/4$. Decompress the first 2 symbols of the Arithmetic coded bit sequence: 111.

Question #4 [ranks 4]. Perform the intersection between the two sets $S_1 = \{1, 8\}$ and $S_2 = \{1, 2, 5, 7, 10, 15, 20\}$ via the algorithm based on “binary search with exponential jumps” (or, doubling search).

Question #5 [rank 3+3+4+3]. Given the binary strings $S=\{001, 10010, 10011, 101\}$.
- Build the Patricia Trie for $S$
- Show how to search for the lexicographic position of the string $P=110$ among the strings of the set $S$.
- Propose a succinct encoding of the Patricia Trie of $S$ that allows navigation in constant time per traversed edge.
- Simulate the downward search for $P=110$ in this succinct encoding.