Encoding

If keywords are MORNING and GOOD, then encoding is

\[
\begin{align*}
\text{MORNING} & \quad \text{ENGLISH: MAHSYOBJTZRCKUNOLVIEFPWGFQX} \\
\text{ABCDEF} & \quad \text{CODE: A BCDEFGHIJKLMNOPQRSTUVWXYZ} \\
\text{HJKLPQ} & \quad \text{CODING: C HIJKLMNOPQRSTUVWXYZABCD} \\
\text{STUWX} & \quad \text{ALPHABETS 3) O PQRSTUVWXYZABCD} \\
\text{YZ} & \quad \text{4) DEFHIJKLMNOPQRSTUVWXYZABC}
\end{align*}
\]

Beginning of message: THERE ARE THERE PORTS

Encoding: OQHNZ PYWQH IQWRT

Decoding

1. Compute \( I.C. = \frac{1}{N(N-1)} \sum_{i=1}^{N} f_i (f_i - 1) \) = about .065 + for 1 alphabet

   = .044 for 5 alphabets

2. Split into 4 or 5 or 6 alphabets and compute I.C. for each alphabet. I.C.'s should be ~ .065+
   
   \( \text{Positions} 1, 5, 9, \ldots, 4k+1 \ldots \) second alphabet uses 2, 6, 10, \ldots, 4k+2,
   
   \( \text{third alphabet uses} 3, 7, 11, \ldots, 4k+3 \ldots \) fourth alphabet uses 4, 8, 12, \ldots, 4k \ldots

3. Form histograms for each alphabet and align histograms to match (approximately) the frequencies. When matched 3 or 4 columns should be void (no occurrences) and a keyword should appear in some column. In above encoding scheme, the keyword in some column would be GOOD. Letters in keyword column should be collapsed to letter A, letters in column to right of keyword column should be collapsed to letter B, etc. - this reduces polyalphabetic code to single-coded alphabet.

4. Break single alphabet code.

Note: In histograms, have 2 copies of each alphabets (52 letters) to make it easy to align offset alphabets.