Spencer, a computational linguist trying to lessen the amount of time he spends on email, writes a simple find-and-replace script that he hopes will mean he spends a little less time typing out language names.

The script goes through his emails before they’re sent and automatically replaces certain two letter ISO 639-1 language codes (like fr) with the full names of the languages (like French):

<table>
<thead>
<tr>
<th>ISO 639-1 code</th>
<th>Language name</th>
</tr>
</thead>
<tbody>
<tr>
<td>ce</td>
<td>Chechen</td>
</tr>
<tr>
<td>ch</td>
<td>Chamorro</td>
</tr>
<tr>
<td>en</td>
<td>English</td>
</tr>
<tr>
<td>fr</td>
<td>French</td>
</tr>
<tr>
<td>he</td>
<td>Hebrew</td>
</tr>
<tr>
<td>is</td>
<td>Icelandic</td>
</tr>
<tr>
<td>ro</td>
<td>Romanian</td>
</tr>
</tbody>
</table>

Things seem to be going great… until he starts getting some very confused replies, like the following:

From: christine@ioling.org
Sent: Monday, 23 August 2010 11:38
To: spencer@ioling.org
Subject: Re: Time-saving script

um, spence? i think something has gone REALLY wrong with your script...

On Mon, Aug 23, 2010 at 09:34 AM spencer@ioling.org wrote:
> Hebrew, ChamorRomanianrICHebrewcHebrewnlandic! whEnglish
> you get a FrEnglishcHebrewe momEnglisht, cHebrewck out
> thICHebrewcHebrewnlandic niICHebrewcHebrewn little
> pRomaniangram i wRomaniante.
> -- spEnglishCHebrewcHebrewnr

(15 points)
(E) BrokEnglish! (2/2)

E1. What message did Spencer intend to send?

E2. Spencer’s script replaced each of the six language codes one after another: for example, all instances of \textit{fr} were replaced before any of the other codes were replaced. Determine \textit{in what order} the script must have replaced the codes.

\begin{center}
\begin{tabular}{ccccccc}
\hline
f & r & then & & then & & then & \\
\hline
\end{tabular}
\end{center}

E3. What would Spencer’s script do to the following input?

\textit{fresh fish from concentrate}

E4. What alternate ordering would produce the longest message when given Spencer’s original email as input?

\begin{center}
\begin{tabular}{cccccccc}
\hline
& & then & & then & & then & & then & r & o. \\
\hline
\end{tabular}
\end{center}