Stephan makes bracelets using the six replacement rules below.

Stephen always starts his pattern with the symbol \[ \text{bracelet} \]. Then, one at a time, he replaces a symbol in the current pattern with a new sequence of symbols based on the rules above. Any symbol that appears on the left side of an arrow can be replaced with a sequence that appears on the right side of a connected arrow. In some, but not all cases, he has a choice about which particular replacement he could make at a particular stage in the process.

**Example**

Stephen could make the bracelet \[
\begin{array}{c}
\text{bracelet} \\
\text{ringlets} \\
\text{clasp}
\end{array}
\]
following these steps:

<table>
<thead>
<tr>
<th>Step</th>
<th>Current Pattern</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>bracelet</td>
<td>Stephen always starts with this symbol</td>
</tr>
</tbody>
</table>
| 2    | ringlets links clasp | is replaced by \[
\begin{array}{c}
\text{ringlets} \\
\text{links} \\
\text{clasp}
\end{array}
\] |
| 3    | \[
\begin{array}{c}
\text{bracelet} \\
\text{ringlets} \\
\text{clasp}
\end{array}
\] | is replaced by \[
\begin{array}{c}
\text{bracelet} \\
\text{ringlets} \\
\text{clasp}
\end{array}
\] |
| 4    | \[
\begin{array}{c}
\text{bracelet} \\
\text{ringlets} \\
\text{clasp}
\end{array}
\] | is replaced by \[
\begin{array}{c}
\text{bracelet} \\
\text{ringlets} \\
\text{clasp}
\end{array}
\] |
| 5    | \[
\begin{array}{c}
\text{bracelet} \\
\text{ringlets} \\
\text{clasp}
\end{array}
\] | is replaced by \[
\begin{array}{c}
\text{bracelet} \\
\text{ringlets} \\
\text{clasp}
\end{array}
\] |
| 6    | \[
\begin{array}{c}
\text{bracelet} \\
\text{ringlets} \\
\text{clasp}
\end{array}
\] | is replaced by \[
\begin{array}{c}
\text{bracelet} \\
\text{ringlets} \\
\text{clasp}
\end{array}
\] |
| 7    | \[
\begin{array}{c}
\text{bracelet} \\
\text{ringlets} \\
\text{clasp}
\end{array}
\] | is replaced by \[
\begin{array}{c}
\text{bracelet} \\
\text{ringlets} \\
\text{clasp}
\end{array}
\] |

**Problems**

1. Give a sequence of steps that Stephen could follow in order to produce the following bracelet:

\[
\begin{array}{c}
\text{bracelet} \\
\text{ringlets} \\
\text{links} \\
\text{clasp}
\end{array}
\]

2. Consider the three bracelets below. Stephen can make exactly two of the three bracelets using the rules. Explain how Stephen can make two of these bracelets, and explain why the remaining bracelet cannot be made using any sequence of steps.

   (a) \[
   \begin{array}{c}
   \text{bracelet} \\
   \text{ringlets} \\
   \text{links} \\
   \text{clasp}
   \end{array}
   \]

   (b) \[
   \begin{array}{c}
   \text{bracelet} \\
   \text{ringlets} \\
   \text{links} \\
   \text{clasp}
   \end{array}
   \]

   (c) \[
   \begin{array}{c}
   \text{bracelet} \\
   \text{ringlets} \\
   \text{links} \\
   \text{clasp}
   \end{array}
   \]

**More Info:**

Check out the CEMC at Home webpage on Wednesday, May 13 for a solution to Bracelets.