Of course, the layout on the page is up to you! But this is the nicest-looking...

The state labels were used to help figure out the design!
1.4 a

At least 3 a's
\[ \rightarrow 1 \xrightarrow{a} 2 \xrightarrow{a} 3 \xrightarrow{a} 4 \]

At least two b's
\[ \rightarrow 1 \xrightarrow{a \ b} 2 \xrightarrow{a \ b} 3 \xrightarrow{a \ b} 4 \]

Product automaton for intersection

Note - correct answers are not unique, so yours could be correct even if they don't look like the ones above.
1.49

Even length

\[ a, b \rightarrow 0 \leftarrow a, b \rightarrow 1 \]

Odd number of a's

\[ 0 \quad 1 \]

Product automaton for intersection

\[ \begin{array}{c}
0, 0 \quad b \\
\quad a \\
0, 1 \quad a \\
\quad b \\
1, 0 \quad a \\
\quad b \\
1, 1 \quad b \\
\quad a \\
\end{array} \]

Extra problem

\[ a \]

\[ \downarrow 20 \]

\[ a \]

\[ \downarrow 1 \]

\[ 0 \leftarrow 1 \rightarrow 2 \]

\[ s(q, a) = 2q + a \mod 3 \]

b) Intuition: the state keeps track of whether you're in an odd position or even position, and what the remainder mod 3 is. (I showed this in class.)
(c) The automaton in part (b) shows the answer in case $n = 3$. In general:

$$(0, 1, \ldots, n-17, 80, 15, 0, 8, 503)$$

where $S(q, a) = (2q + a) \mod n$. 