1. Represent the following expressions with disks, regrouping as necessary, writing a matching expression, and recording the partial products vertically.

a. $3 \times 24$

\[
\begin{array}{c|c}
\text{tens} & \text{ones} \\
\hline
\text{\# of disks} & \text{\# of disks}
\end{array}
\]

\[
\begin{array}{c}
\frac{24}{x} \frac{3}{12} \rightarrow 3 \times 4 \text{ ones} \\
\frac{60}{12} \rightarrow 3 \times 2 \text{ tens}
\end{array}
\]

b. $3 \times 42$

\begin{array}{|c|c|c|}
\hline
\text{hundreds} & \text{tens} & \text{ones} \\
\hline
\text{\# of disks} & \text{\# of disks} & \text{\# of disks}
\end{array}

\[12 \rightarrow 3 \times 4 \text{ ones} \]

\[60 \rightarrow 3 \times 2 \text{ tens} \]

c. $4 \times 34$

\begin{array}{|c|c|c|}
\hline
\text{hundreds} & \text{tens} & \text{ones} \\
\hline
\text{\# of disks} & \text{\# of disks} & \text{\# of disks}
\end{array}

\[12 \rightarrow 3 \times 4 \text{ ones} \]

\[60 \rightarrow 3 \times 2 \text{ tens} \]
2. Represent the following expressions with disks, regrouping as necessary. To the right, record the partial products vertically.

a. $4 \times 27$

<table>
<thead>
<tr>
<th>hundreds</th>
<th>tens</th>
<th>ones</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>80</td>
<td>28</td>
</tr>
</tbody>
</table>

$\begin{array}{c}
27 \\
\times 4 \\
\end{array}$

\[ \frac{28}{4 \times 7 \text{ ones}} \]

\[ \frac{80}{4 \times 2 \text{ tens}} \]

\[ 108 \]

b. $5 \times 42$

<table>
<thead>
<tr>
<th>hundreds</th>
<th>tens</th>
<th>ones</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Cindy says she found a shortcut for doing multiplication problems. When she multiplies $3 \times 24$, she says, "$3 \times 4$ is 12 ones, or 1 ten and 2 ones. Then, there's just 2 tens left in 24, so add it up, and you get 3 tens and 2 ones." Do you think Cindy's shortcut works? Explain your thinking in words and justify your response using a model or partial products.

$\begin{array}{c}
24 \\
\times 3 \\
\end{array}$

\[ \frac{12}{3 \times 4 \text{ ones}} \]

\[ \begin{array}{c}
60 \\
\end{array} + \]

\[ \frac{2 \times 2 \text{ tens}}{72} \]

Cindy's shortcut does not work. You don't add the 2 tens to 12. You multiply the 2 tens by 3 (60) and add that to 12, which equals 72.