1. **Exclusive Or**
   For each of the following, decide whether inclusive-or or exclusive-or is intended:
   
   (a) Experience with C or Java is required.
   
   **Solution:**
   Inclusive Or.
   
   (b) Lunch includes soup or salad.
   
   **Solution:**
   Exclusive Or.
   
   (c) Publish or perish
   
   **Solution:**
   Exclusive Or.
   
   (d) To enter the country you need a passport or voter registration card.
   
   **Solution:**
   Inclusive Or.

2. **Translations**
   For each of the following, define propositional variables and translate the sentences into logical notation.
   
   (a) I will remember to send you the address only if you send me an e-mail message.
   
   **Solution:**
   
   \[
   p : \text{I will remember to send you the address}
   
   q : \text{You send me an e-mail message}
   
   \[p \rightarrow q\]
   
   (b) If berries are ripe along the trail, hiking is safe if and only if grizzly bears have not been seen in the area.
   
   **Solution:**
   
   \[
   p : \text{Berries are ripe along the trail}
   
   q : \text{Hiking is safe}
   
   r : \text{Grizzly bears have not been seen in the area}
   
   \[p \rightarrow (q \leftrightarrow r)\]
   
   (c) Unless I am trying to type something, my cat is either eating or sleeping.
Solution:

\[
p : \text{My cat is eating}
\]
\[
q : \text{My cat is sleeping}
\]
\[
r : \text{I’m trying to type}
\]
\[
¬r \rightarrow (p \oplus q)
\]

3. Teatime
Consider the following sentence:

If I am drinking tea then I am eating a cookie, or, if I am eating a cookie then I am drinking tea.

(a) Define propositional variables and translate the sentence into an expression in logical notation.

Solution:

\[
p : \text{I am drinking tea}
\]
\[
q : \text{I am eating a cookie}
\]
\[
(p \rightarrow q) \lor (q \rightarrow p)
\]

(b) Fill out a truth table for your expression.

Solution:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>(p \rightarrow q)</th>
<th>(q \rightarrow p)</th>
<th>((p \rightarrow q) \lor (q \rightarrow p))</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>T</td>
<td>T</td>
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<tr>
<td>T</td>
<td>F</td>
<td>F</td>
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</tbody>
</table>
4. Truth Tables
Write a truth table for each of the following:

(a) \((p \oplus q) \lor (p \oplus \neg q)\)

Solution:

<table>
<thead>
<tr>
<th>(p)</th>
<th>(q)</th>
<th>(p \oplus q)</th>
<th>(p \oplus \neg q)</th>
<th>((p \oplus q) \lor (p \oplus \neg q))</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>T</td>
<td>F</td>
<td>T</td>
<td>T</td>
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</tr>
</tbody>
</table>

(b) \((p \lor q) \rightarrow (p \oplus q)\)

Solution:

<table>
<thead>
<tr>
<th>(p)</th>
<th>(q)</th>
<th>(p \lor q)</th>
<th>(p \oplus q)</th>
<th>((p \lor q) \rightarrow (p \oplus q))</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
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</tbody>
</table>

(c) \(p \leftrightarrow \neg p\)

Solution:

<table>
<thead>
<tr>
<th>(p)</th>
<th>(\neg p)</th>
<th>(p \leftrightarrow \neg p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>F</td>
<td>F</td>
</tr>
<tr>
<td>F</td>
<td>T</td>
<td>F</td>
</tr>
</tbody>
</table>

5. Circuitous
Translate the following circuit into a logical expression.

Solution:
\(\neg(\neg p \lor (p \land \neg q))\)