Lab No 2. Title: Use of Boolean Algebra and de Morgan’s Law

**Objectives:** To simplify Logic circuits by Boolean Laws
**Equipment:** Logic Board with stackable connector leads
**Theory:** The operation of Basic Logic gates and Boolean Laws.

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**Part A. Use of de Morgan’s Law**

1. Draw the Boolean expression corresponding to the circuit.
2. Use de Morgan’s Law to simplify the obtained Boolean expression.
3. Draw the circuit for simplified expression.
4. Build and compare the Truth Tables for initial and final circuits

Circuit 1

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**Circuit 2**

![Diagram of Circuit 2](image)

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**Part B. Use of de Boolean Laws**

1. Draw the Boolean expression corresponding to the circuit.
2. Apply Boolean Laws to simplify the obtained Boolean expression.
3. Draw the circuit for simplified expression.
4. Build and compare the Truth Tables for initial and final circuits

![Diagram of the simplified circuit](image)

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Part C. Exclusive OR

An Exclusive OR (XOR) is an important component of logic family. It is not presented on the Logic Tutor Board, however it can be build and studied with help of basic logic gates.

1. Use the following logic identity \( A \oplus B = \overline{A}B + A\overline{B} = (A + B) \cdot \overline{A}\overline{B} \) to draw a circuit for XOR.

2. Build a circuit and create a Truth Table.

3. Connect an input A to the low-frequency CLOCK generator.

4. Observe the performance of the circuit for both values of input B.

5. Suggest a possible application for XOR gate.

\[
\begin{array}{ccc}
A & B & Q \\
0 & 0 & \\
0 & 1 & \\
1 & 0 & \\
1 & 1 & \\
\end{array}
\]