

3. Karnaugh Map Exercises

Next we will use LogicAid to get some practice with Karnaugh maps. Close all windows that are currently open in LogicAid. Then choose Tutorial Mode under the K-map menu. Tutorial mode will allow you to enter K-maps, circle groups of 1's in the map, and write the logic expression that corresponds to each group of 1's. Note that complements are denoted by ' rather than the overbar that we have used. LogicAid will tell you if you make an error. Try to simplify each of the following K-maps, and record the simplified expressions in your lab notebook.

- 2 variables: $F = m_1 + m_2 + m_3$
- 3 variables: $F = m_3 + m_2 + m_4 + m_5$
- 3 variables: $F = m_3 + m_4 + m_7 + m_6$
- 3 variables: $F = m_1 + m_3 + m_2 + m_5 + m_7$
- 3 variables: $F = m_0 + m_2 + m_4 + m_5 + m_6$
- 4 variables: $F = m_0 + m_1 + m_4 + m_5 + m_{12} + m_{13} + m_8 + m_9 + m_2 + m_6 + m_{14}$
- 4 variables: $F = m_0 + m_1 + m_2 + m_6 + m_8 + m_9 + m_{10}$

4. Logic Circuit Design Problems

Design logic circuits using AND, OR, and NOT gates to control segments “a” and “b” in the 7-segment display. Your circuit is a subset of the logic contained in the 7447 IC that we used in the stopwatch. Use Karnaugh maps to simplify your logic circuit.

Work on the two logic design problems described on the following page. There are many correct solutions to these problems, as well as incorrect solutions. Please justify the assumptions that you make. We will discuss solutions to these design problems in class on Monday, April 20.