8.1 4-bit D Latch:

Our first problem here lay in a lack of power. We had forgotten to connect the black power cord, so Bus 2 was not powered. We were confused because Bus 1 had some power from the launchpad. On adding power, we had to rearrange some of our wires because of mistakes made in set-up. Otherwise, Bus 1 correctly displayed binary counting and Bus 2 would show the same number when Enable 1 was activated.

8.2 4-bit Full Binary Adder

In setting up the latch, we did not realize at first that Vcc and Ground must be connected to the adder. This problem was difficult to diagnose because the LEDs were lighting up; they simply were not lighting up in the correct combination or order. However, we did eventually get the latch working; it added correctly, and disconnecting C0 from ground allowed the carry adder to work correctly.

8.3 Theorems of Boolean Algebra

We used the first approach and changed count\_limit to 0x04 in the main.c code. This method worked; the first two bits successfully counted from 0 to 3.

8.3.1 De Morgan’s Theorem

In building these circuits, we experienced two main problems. First, we directed y to Bus 1, which was already receiving input from the Launchpad. Second, we neglected to connect each of the gates to Ground and Vcc. Once we fixed those problems, we were able to successfully construct each of the circuits.

* De Morgan’s Theorem: (ABC)’ = A’+B’+C’ and (A+B+C)’ = A’B’C’
* To illustrate (BC)’, we used an AND gate followed by an inverter.
* To illustrate B’+C’, we used an inverter (for both imputs) and then a NOR gate.
* To illustrate (B+C)’, we used a NOR gate followed by an inverter.
* To illustrate B’C’, we used an inverter (for both imputs) and then an AND gate.

8.3.2 Covering Theorem

We constructed these using the same method as that used for the De Morgan’s Theorem circuits.

* Covering Theorem: B(B+C) = B and B + (BC) = B
* To illustrate B(B+C) = B, we imput B and C through an OR gate and then put the OR-gate output and B through an AND gate. The output Y = input B.
* To illustrate B + (BC) = B, we imput B and C through an AND gate and then put the AND-gate output and B through an OR gate. The output Y = input B.