Digital Design Notes:

* Data Sizes in Binary
  + Nibble 4 bit
  + Byte 8 bit
  + Word 16 or 32 bit
    - Fundamental internal register size of a processor.
  + Double word 32 or 64 bit
* Common bit ranges
  + 8 bits – 2^8 = 256
  + 10 bits – 2^10 = 1024 = 0x400 = 1K
  + 12 bits – 2^12 = 4096 = 0x1000 = 4K
  + 16 bits – 2^16 = 65,534 = 0xFFFF =
* Binary coded decimal BCD
  + 4 bit representation (sometimes called nibble)
  + 0 through 9
  + Easy to read, but inefficient in range because we lose about 40% vs. binary for each nibble.
  + Not used very much anymore, I think used in PDP DEC and Calculators way back in the day.
  + We will also use it in our laboratory.
  + Packed BCD’s
    - Packed 2 digits per byte
    - unpacked 3 digits per byte
* Boolean Algebra
  + Variables represent either 0 or 1
  + Operators return either 0 or 1
  + Basic operations
    - AND:
      * If a AND b is 1, then returns 1, else return 0
    - OR:
      * a OR b returns 1 if either or both a = 1 or b = 1
    - NOT:
      * returns opposite of a
      * If a=0 then return 1, if a=1 then return 0
  + Verilog example
    - Load up ISE project
    - Open Xilinx
    - Open lab1.xise project file
    - Modify code
    - Go to top level wrapper
      * Top\_io\_wrapper\_gates
      * Right Click generate programming file
        + Run all
    - Transfer the programming file to your desktop
    - Transfer the file to the board itself using digilant software