# Name: Section:

# Homework Assignment: submit via gradescope

1. I'm deleting this problem since you should already know how to do this. Is this a good assumption?

~~For each of the 18-bit 2's complement numbers~~

* + ~~Determine the hex and decimal value.~~
  + ~~Calculate, by hand and show your work, the 2's complement.~~

~~Note that the comma's in the values below are only there to make reading the values more straightforward.~~

1. ~~01,0111,1010,0110,1001~~
2. ~~00,0101,1101,1001,0010~~
3. ~~10,1011,0001,1000,0110~~
4. ~~11,1010,1100,0011,1010~~
5. In the following problem, you will build vhdl function called **Scancode decoder** which processes keyboard scancodes. When you press a key on a keyboard, the keyboard sends an 8-bit code to the computer called a PS2 scancode. Each key has its own scancode listed below. The relationship between the keys and their scancode is not based on ASCII nor any other discernible pattern.

|  |  |
| --- | --- |
| Keyboard Key | Scancode (in hex) |
| 0 | 0x45 |
| 1 | 0x16 |
| 2 | 0x1E |
| 3 | 0x26 |
| 4 | 0x25 |
| 5 | 0x2E |
| 6 | 0x36 |
| 7 | 0x3D |
| 8 | 0x3E |
| 9 | 0x46 |

Build a function which converts an 8-bit scancode for the digits 0-9 into a 4-bit hexadecimal values.

|  |  |
| --- | --- |
| Nomenclature: | Scancode decoder |
| Data Input: | D = std\_logic\_vector(7 downto 0); |
| Data Output: | H = std\_logic\_vector(3 downto ); |
| Control: | none |
| Status: | none |
| Behavior: | Converts the scancode d, representing a the key of a decimal digit, into its 4-bit value. For example, if D = 25\_16, the scancode for the character "4", then the converter should output H = 0100\_2. Assume that the inputs are always legal hexadecimal scancodes. |

Use the ***when*** statement syntax to describe the output in terms of the input.

1. Create a testbench to simulate and demonstrate your function works for all the 10 values in the first table. Provide a print out of the resulting simulation timing diagram below - make the signal values legible.
2. In Bitbucket, provide the vhld code for your **Scancode decoder** function along with a complete header.
3. In Bitbucket, provide the vhdl code for your testbench