http://cs.txstate.edu/~lk04/2318/DriCha/BannerLine1.gif

**Drills and Challenges on**

|  |
| --- |
| *Digital Data Representation* |

NOTE: Questions are not listed in any particular order.

|  |  |
| --- | --- |
| http://cs.txstate.edu/~lk04/2318/DriCha/BulletL1_7x15.gif | Determine the # of states a dedicated digital clock can assume if it displays time as illustrated below: |

|  |  |  |
| --- | --- | --- |
|  |  | http://cs.txstate.edu/~lk04/2318/DriCha/DigitalClock_hhmmssAmPm.gif |

|  |  |
| --- | --- |
|  |  |

|  |  |
| --- | --- |
| http://cs.txstate.edu/~lk04/2318/DriCha/BulletL1_7x15.gif | Manually represent the following *decimal unsigned whole numbers* in *binary* (using as many bits as needed or more) in arguably the quickest (and least-error-prone) way: |

|  |  |  |
| --- | --- | --- |
|  |  | 132  = |

|  |  |  |
| --- | --- | --- |
|  |  | 515  = |

|  |  |  |
| --- | --- | --- |
|  |  | 1029 = |

|  |  |
| --- | --- |
|  | TIP: Each of the numbers is *slightly higher* than some power of 2. |

|  |  |
| --- | --- |
|  |  |

|  |  |
| --- | --- |
| http://cs.txstate.edu/~lk04/2318/DriCha/BulletL1_7x15.gif | Manually represent the following *decimal unsigned whole numbers* in *binary* (using as many bits as needed or more) in arguably the quickest (and least-error-prone) way: |

|  |  |  |
| --- | --- | --- |
|  |  | 123  = |

|  |  |  |
| --- | --- | --- |
|  |  | 501  = |

|  |  |  |
| --- | --- | --- |
|  |  | 1012 = |

|  |  |
| --- | --- |
|  | TIP: Each of the numbers is *slightly lower* than some power of 2. |

|  |  |
| --- | --- |
|  |  |

|  |  |
| --- | --- |
| http://cs.txstate.edu/~lk04/2318/DriCha/BulletL1_7x15.gif | Manually represent the following *negative whole numbers* in *2C* (using as many bits as needed or more) in arguably the quickest (and least-error-prone) way: |

|  |  |  |
| --- | --- | --- |
|  |  | -4   = |

|  |  |  |
| --- | --- | --- |
|  |  | -32  = |

|  |  |  |
| --- | --- | --- |
|  |  | -256 = |

|  |  |
| --- | --- |
|  | TIP: The magnitude of each of the numbers is some power of 2. |

|  |  |
| --- | --- |
|  |  |

|  |  |
| --- | --- |
| http://cs.txstate.edu/~lk04/2318/DriCha/BulletL1_7x15.gif | Manually represent the following *negative whole numbers* in *2C* using 16 bits in arguably the quickest (and least-error-prone) way: |

|  |  |  |
| --- | --- | --- |
|  |  | -3   = |

|  |  |  |
| --- | --- | --- |
|  |  | -6   = |

|  |  |  |
| --- | --- | --- |
|  |  | -12  = |

|  |  |  |
| --- | --- | --- |
|  |  | -21  = |

|  |  |
| --- | --- |
|  | TIP: 2C representation for -1 all 1's (16 1's in 16 bits). |

|  |  |
| --- | --- |
|  |  |

|  |  |
| --- | --- |
| http://cs.txstate.edu/~lk04/2318/DriCha/BulletL1_7x15.gif | Extend/lengthen following binary #s to 12 bits: |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | ***Unsigned*** | ***2C*** |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | \_\_\_\_\_0100010 | \_\_\_\_\_0100010 |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | \_\_\_\_\_1010111 | \_\_\_\_\_1010111 |

|  |  |
| --- | --- |
|  |  |

|  |  |
| --- | --- |
| http://cs.txstate.edu/~lk04/2318/DriCha/BulletL1_7x15.gif | Extend/lengthen following #s (shown in *hex*) to 32 bits (still in *hex*): |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | ***Unsigned*** | ***2C*** |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | \_\_\_\_0021 | \_\_\_\_0021 |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | \_\_\_\_7ACE | \_\_\_\_7ACE |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | \_\_\_\_8BAD | \_\_\_\_8BAD |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | \_\_\_\_FEED | \_\_\_\_FEED |

|  |  |
| --- | --- |
|  |  |

|  |  |
| --- | --- |
| http://cs.txstate.edu/~lk04/2318/DriCha/BulletL1_7x15.gif | Contract/shorten following *binary* #s to minimum # of bits: |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | ***Unsigned*** | ***2C*** |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | 000000100010 | 000000100010 |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | 111111010111 | 111111010111 |

|  |  |
| --- | --- |
|  |  |

|  |  |
| --- | --- |
| http://cs.txstate.edu/~lk04/2318/DriCha/BulletL1_7x15.gif | Contract/shorten following #s (shown in *hex*) to minimum # of *hex* digits: |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | ***Unsigned*** | ***2C*** |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | 0051 | 0051 |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | 00A2 | 00A2 |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | F8AD | F8AD |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | FEED | FEED |

|  |  |
| --- | --- |
|  |  |

|  |  |
| --- | --- |
| http://cs.txstate.edu/~lk04/2318/DriCha/BulletL1_7x15.gif | Contract/shorten following #s (shown in *hex*) to minimum # of *bits*: |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | ***Unsigned*** | ***2C*** |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | 0051 | 0051 |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | 00A2 | 00A2 |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | F8AD | F8AD |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | FEED | FEED |

|  |  |
| --- | --- |
|  |  |

|  |  |
| --- | --- |
| http://cs.txstate.edu/~lk04/2318/DriCha/BulletL1_7x15.gif | Order these 2C #s in bin from 1 to 4 (most –ve to most +ve), WITHOUT resorting to evaluating them in decimal: |

|  |  |  |
| --- | --- | --- |
|  |  | \_\_\_\_\_ 10010000001 |

|  |  |  |
| --- | --- | --- |
|  |  | \_\_\_\_\_ 00010000001 |

|  |  |  |
| --- | --- | --- |
|  |  | \_\_\_\_\_ 10000010001 |

|  |  |  |
| --- | --- | --- |
|  |  | \_\_\_\_\_ 10010000011 |

|  |  |
| --- | --- |
|  |  |

|  |  |
| --- | --- |
| http://cs.txstate.edu/~lk04/2318/DriCha/BulletL1_7x15.gif | Order these IEEE754 SP #s in bin from 1 to 4 (most –ve to most +ve), WITHOUT resorting to evaluating them in decimal: |

|  |  |  |
| --- | --- | --- |
|  |  | \_\_\_\_\_ 1 11110000 11100000000011111111111 |

|  |  |  |
| --- | --- | --- |
|  |  | \_\_\_\_\_ 1 11110000 00011100000011111111111 |

|  |  |  |
| --- | --- | --- |
|  |  | \_\_\_\_\_ 0 11110000 00011100000011111111111 |

|  |  |  |
| --- | --- | --- |
|  |  | \_\_\_\_\_ 0 00001111 00011100000011111111111 |

|  |  |
| --- | --- |
|  |  |

|  |  |
| --- | --- |
| http://cs.txstate.edu/~lk04/2318/DriCha/BulletL1_7x15.gif | The string ”**Year 1984**” has the following ASCII encoding: 59h, 65h, 61h, 72h, 20h, 31h, 39h, 38h, 34h. Without referring to any encoding chart, give the ASCII encoding for the string ”**YEAR 2008**”. |

|  |  |
| --- | --- |
|  |  |

|  |  |
| --- | --- |
|  |  |

|  |
| --- |
| **(more may be added at any time)** |

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| --- | --- |
|  |  |