**CIS 350 – INFRASTRUCTURE TECHNOLOGIES**
**SOLUTION TO HOMEWORK #2**

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Assume unsigned numbers (≥0). You may use your calculator and scratchpad. If your calculator has built-in conversion functions, do not use them! Submit the solution, one per group, via the Assignments/Homework folder on Blackboard by the due date. **You must provide answers on this sheet**. You may attach a scratchpad with calculations (optional).

**Topics**: Number systems and conversion between number bases

1. Convert to Binary:

| | | | |
|---|---|---|---|
| decimal: | $(70)_{10}$ | binary: | 1000110 |
| octal: | $(765)_8$ | binary: | 111110101 |
| hexa: | $(AB6)_{16}$ | binary: | 101010110110 |

2. Convert to Octal:

| | | | |
|---|---|---|---|
| decimal: | $(70)_{10}$ | octal: | 106 |
| binary: | $(10101011)_2$ | octal: | 253 |
| hexa: | $(EA)_{16}$ | octal: | 352 |

3. Convert to Decimal:

| | | | |
|---|---|---|---|
| binary: | $(10101001)_2$ | decimal: | 169 |
| octal: | $(763)_8$ | decimal: | 111110011 |
| hexa: | $(4AD)_{16}$ | decimal: | 1197 |

4. Convert to Hexadecimal:

| | | | |
|---|---|---|---|
| binary: | $(10110110011)_2$ | hexadecimal: | 5B3 |
| octal: | $(673)_8$ | hexadecimal: | 1BB |
| decimal: | $(170)_{10}$ | hexadecimal: | AA |

5. Convert Binary to Decimal, Octal, and Hexadecimal. (Note the decimal point):

| | | | |
|---|---|---|---|
| binary: | $(1010011.01)_2$ | decimal: | 83.25 |
| binary: | $(10110010.111101)_2$ | octal: | 262.75 |
| binary: | $(11101101.1110011)_2$ | hexadecimal: | ED.E6 |

6. Convert from Decimal to Hexadecimal and Octal. If the answer is irrational, stop at four hexadecimal digits. (Note the decimal point):

| | | | |
|---|---|---|---|
| decimal: | $(0.734375)_{10}$ | octal: | 0.57 |
| decimal: | $(0.671875)_{10}$ | hexadecimal: | 0.AC |

7. Convert Octal to Hexadecimal through Binary
$(754)_8 = (\ 111101100\ )_2 = (\ 1EC\ )_{16}$

8. Convert Decimal to Hexadecimal through Binary. (Note the decimal point):
$(45.5)_{10} = (\ 101101.1\ )_2 = (\ 2D.8\ )_{16}$

9. How many bits will it take to represent the decimal number 6,500,000? How many bytes will it take to store this number?

The number of bits = 23
$2^n - 1 >= 6500000$
$2^n >= 6500001$
$n >= \log_2 6500001 >= 22.63$

The number of bytes = **3**
23/8 = 2.875

10. Some older computers used an 18-bit word to store numbers. What is the number of unique patterns that 18 bits can represent? What is the decimal range for this word size?

The number of unique patterns = 262144
$2^{18} = 262144$

The decimal range = [ 0 , 262143 ]