

Computing Mathematics

NUMBER BASES

1. Conversions
 - a. Base "B" to decimal
 - b. Decimal to base "B"
 - c. Hex to binary
 - d. Binary to Hex
2. 0 to 15 Dec/Bin/Hex table
3. Binary addition and subtraction

MODULAR ARITHMETIC

1. Describe how to find the smallest congruence given a modulus
2. Define modulus
3. Create an addition table
4. Solve addition problems mod n

STRING OPERATIONS

Describe and use:

1. Two's Complement
2. Reverse
3. Transpose n places
4. Checksum
5. String Length
6. MSB/LSB (all 3 usages of B: bit, bits, and byte)
7. Concatenate
8. Pad to a length of n bits
9. Split into n strings

TIME COMPLEXITY

1. Given an algorithm and two data sets of different lengths:
 - a. Count the number of steps required to process each data set
 - b. Determine if the algorithm runs in $O(1)$, $O(n)$, or $O(n^2)$ time
2. Describe Big-O notation and what it means
3. State the following functions in order from the fastest to slowest time complexity:
 - a. Constant $O(1)$
 - b. Log $O(\log n)$
 - c. Root $O(\sqrt[n]{n})$
Square Root $O(\sqrt{n})$
 - d. Linear $O(n)$
 - e. Lin-Log $O(n \log n)$
 - f. Polynomial $O(n^x)$
Quadratic $O(n^2)$
 - g. Exponential $O(2^n)$
 - h. Factorial $O(n!)$

SEARCH ALGORITHMS

1. Linear Search
 - a. Describe the process
 - b. Worst-case time complexity
2. Binary Search
 - a. Describe the process
 - b. Sorting algorithms and ordering a list
 - c. Worst-case time complexity
3. Hash Table Search
 - a. Describe the process
 - b. Worst-case time complexity
 - c. Average time complexity