

# Day 3 - Programs at Bootcamp

## Section A - Elements of Programing :- Condition, Loops and Logical Programming

1. Write a program that takes a range of number as input and outputs the Prime Numbers in that range.
2. Write a program **Binary.java** prints the binary (base 2) representation of the decimal number typed as the command-line argument. It is based on decomposing the number into a sum of powers of 2. For example, the binary representation of 106 is 11010102, which is the same as saying that  $106 = 64 + 32 + 8 + 2$ . Ensure necessary padding to represent 4 Byte String.

To compute the binary representation of  $n$ , we consider the powers of 2 less than or equal to  $n$  in decreasing order to determine which belong in the binary decomposition (and therefore correspond to a 1 bit in the binary representation).

3. Extend Binary.java to read an integer as an Input, convert to Binary and perform the following functions.
  - i. Swap nibbles and find the new number.
  - ii. Find the resultant number is the number is a power of 2.

A nibble is a four-bit aggregation, or half an octet. There are two nibbles in a byte.

Given a byte, swap the two nibbles in it. For example 100 is to be represented as 01100100 in a byte (or 8 bits). The two nibbles are (0110) and (0100). If we swap the two nibbles, we get 01000110 which is 70 in decimal.

4. Write two programs Sin.java and Cos.java that compute  $\sin x$  and  $\cos x$  using the Taylor series expansions as shown below...

Note - Convert angle  $x$  to an angle between  $-2\pi$  and  $2\pi$  using following logic

$x = x \% (2 * \text{Math.PI});$

$$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots$$

$$\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \dots$$

# Day 3 - Programs at Home

## Section A - Elements of Programing :- Condition, Loops and Logical Programming

1. Write a program RollDie.java that generates the result of rolling a fair six-sided die (an integer between 1 and 6). Repeat the Die Roll n times and suggest which number between 1 and 6 fall maximum number of times.
2. Given an array with 100 integers containing 1 to 100 and among them one number is repeated twice. Write the Logic to find out the repeated number.
3. Write a program to find the 2nd largest and the 2nd smallest element from an unsorted array and without sorting the array.
4. Write a program to compute Factors of a number N using prime factorization method.

Logic -> Traverse till  $i*i \leq N$  instead of  $i \leq N$  for efficiency.

O/P -> Print the prime factors of number N.