COM2002 INTERMEDIATE PROGRAMMING
2024 – 2025 SPRING

Laboratory Week: 17 – 21 February 2025

Topic : Pointers and Arrays

Program-1 : Find mode, arithmetic mean, and harmonic mean (find_mode_mean.c)

Definition : The program finds the mode of array and calculates both arithmetic and harmonic mean.

Mode: The most common value in a set of numerical values.

Median: The middle value if all values in a set of numerical values were ordered.

Arithmetic mean: The average of a set of numerical values, as calculated by adding them together and dividing by the number of terms in the set.

$$Arithmetic\ mean = \frac{\sum_{i=0}^{N} X_i}{N} \quad where\ N\ is\ the\ number\ of\ values\ in\ a\ set$$

Harmonic mean: The reciprocal of the arithmetic mean of a set of numerical values, as calculated the number of values divided by adding reciprocal of the values (one over each value).

$$Harmonic\ mean = \frac{N}{\sum_{i=0}^{N} \frac{1}{X_i}} \quad where\ N\ is\ the\ number\ of\ values\ in\ a\ set$$

Use the following functions prototype to develop main function.

int find_mode(int array[], int size);

void calculate_arithmetic_mean(int array[], int size, float *a_mean);

void calculate_harmonic_mean(int array[], int size, float *h_mean);

void printArray(int array[], int size)

Expected output:

```
***One-dimensional array***
32   32   32   32   32   34   32   26   28   28   29   31   24   27   25   27
28   30   29   29   29   31   32   31   29   31   31   31   35   33
The mode of array is 32
The arithmetic mean of array is 30.000000
The harmonic mean of array is 29.771446

***Multidimensional array***
4    4    82   34   56
5    34   76   90   76
2    6    1    2    45
```

```
The mode of the first row of the 2D array is 4
The arithmetic mean of the first row of the 2D array is 36.000000
The harmonic mean of the first row of the 2D array is 8.937125
```

Modify the find_mode_mean.c program: Try to find the median of the array.

Program-2 : Display reverse of the message (reverse.c)

Definition : The program that reads a message, then prints the reversal of the message.

Hint: Read the message one character at a time (using getchar) and store the characters in an array. Stop reading when the array is full or the character read is '\n'.

Expected output:

```
Enter a message: Don't get mad, get even.
Reversal is: .neve teg ,dam teg t'noD
```

Modify the reverse.c program (reverse-Modify.c) to use a pointer instead of an integer to keep track of the current position in the array.

Simplify the reverse-Modify.c program (reverse-Simplify.c) by taking advantage of the fact that an array name can be used as a pointer.

Program-3 : Reversing a Series of Numbers (reverse_num.c)

Definition : The program that reads 10 numbers, then writes the numbers in reverse order. The program stores the numbers in an array as they're read, then goes through the array backwards, printing the elements one by one. The original program stores the numbers in an array, with subscripting used to access elements of the array. New version of the program in which subscripting has been replaced with pointer arithmetic.

Expected output:

```
Enter 10 numbers: 34 82 49 102 7 94 23 11 50 31
In reverse order: 31 50 11 23 94 7 102 49 82 34
```