This document contains the contents of the project work for computer programming course, pertaining 40 points from the finals.

Final Exam Project:

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The proceeding explanations will be a detailed analysis of the project work. The build of the project is a makeshift calculator that does basic functions but also covers some extensive topics as well. Albeit not the best one that could have been made but also fitting the requirement as much as possible, covering all the topics taken up until these points:

The code is comprised in the following format:
1. Libraries inclusion.
2. Naming functions.
3. Main function where all the respective functions are called.
4. Ending main.
5. Started identifying and creating the named functions.

This program was created for the sole purpose of making an all-in-one convenient working calculator, and for the purpose of learning and understanding the nature of coding. It is also in terms of its functionality very convenient and practical and includes with it, history functionality, where all the outputs are collected and saved and can be called upon later.

This project also covers all parts pertaining to the course taken, meaning all topics covered in the class and homework, or otherwise, were covered.

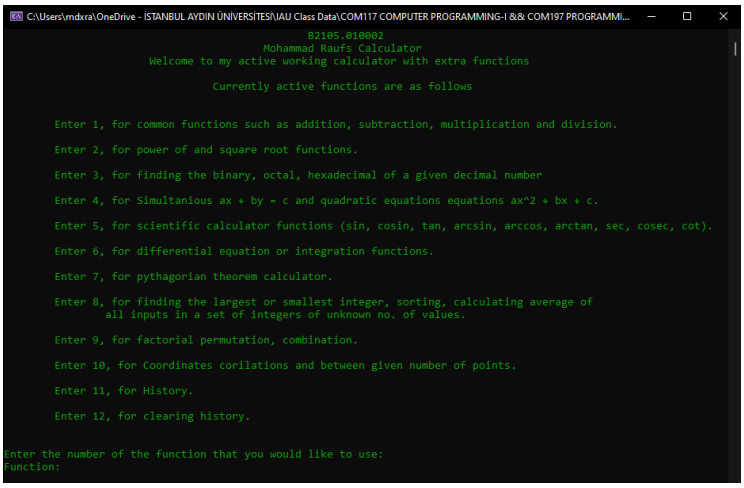
Code Overview:

The code starts with the usual library calling, mainly <stdio.h> for our C functions, and <math.h> for all our mathematical functions.
Then it proceeds to name the functions, this approach was taken because it was intended that the main() function be up top and the other functions that are to be called are at the bottom, mainly for the sake of appearances.

This code also covers major topics taken in this course, mainly including the likes of structs, files, arrays, and memory allocation. This code consists of an extensive implementation of all terms and concepts clarified by the instructor, with the added benefit of being extremely user friendly and from the moment of running will also be very self-explanatory. For an in-depth manual, refer bellow.

User manual:

The program when run the first time will display something like this:



Displaying all the possible capabilities of the program. Any input by the user will be taken and an action will be performed.
Note: Do not enter a character. This will break the code and isn't really the function of this calculator.

If any number that is above 12 and bellow 1 is entered, the program detects an error and re prompts the user to enter their desired function again, there are only 3 attempts so after the third wrong entry the program ends.

If 1 is entered, the user is prompted to enter an operator then they are requested to enter two values and the program prints the output.

```
input an operator '+' , '-' , '/' , '*' : /
enter 2 values:
value 1: 2500
value 2: 1500
The result of 2500.00 / 1500.00 = 1.667

continue? (y/n) :
```

If 2 is entered, the function allows calculation of any number with any exponent and can also calculate root of any number.

```
Enter:
1. for Power function.
2. for Square Root function.
Function: 1
enter a number: 1256
enter a power: 3
The 3 power of 1256.00 is equal to 1981385216.00
continue? (y/n) :
```

```
Enter:
1. for Power function.
2. for Square Root function.
Function: 1
enter a number: 1256
enter a power: 3
The 3 power of 1256.00 is equal to 1981385216.00
continue? (y/n) :
```

If 3 is entered, the program can calculate the binary, hexadecimal and octal of a given integer.

```
Enter a decimal number: 256636
hexadecimal = 3EA7C
octal = 765174
binary = 111110101001111100

continue? (y/n) :
```

If 4 is entered, the program can find the values of X and Y, from simultaneous equations given that the values are a, b, c, I, j and k, from ax + by = c and ix + jy = k, and a, b and c from ax^2 + bx + c.

```
Enter 1 for simultanious equations.
Enter 2 for quadratic equations.
Function:1
Enter the values of coefficents A, B and C, of the first equation of the form Ax+By=C
Enter A : 2
Enter B : 4
Enter C : 6
Enter the values of coefficents I, J and K, of the second equation of the form Ix+Jy=K
Enter I : 4
Enter J : 8
Enter K : 12
Infinitely many solutions are piossible
The value of x can be varied and y can be calculated according to x's value using relation
y=1.500+(-0.500)x

continue? (y/n) :
```

```
Enter 1 for simultanious equations.
Enter 2 for quadratic equations.
Function:1
Enter the values of coefficents A, B and C, of the first equation of the form Ax+By=C
Enter A : 25
Enter B : 30
Enter C : 36
Enter the values of coefficents I, J and K, of the second equation of the form Ix+Jy=K
Enter I : 22
Enter J : 55
Enter K : 88
The solution to the equations is unique
The value of x=-0.923
The value of y=1.969

continue? (y/n) :
```

```
Enter 1 for simultanious equations.
Enter 2 for quadratic equations.
Function:2
Enter coefficients A, B and C:
Enter A : 2
Enter B : 4
Enter C : 4
first root = -1.00+1.00i and second root = -1.00-1.00i

continue? (y/n) :
```

```
Enter 1 for simultanious equations.
Enter 2 for quadratic equations.
Function:
2
Enter coefficients A, B and C:
Enter A : 1
Enter B : 2
Enter C : 1
x 1 and x 2 is equal to -1.000

continue? (y/n) :
```

If 5 is entered, the number “a” taken from the user will be used in almost all the trigonometry functions.
Example:
Sin(a) cos(a) tan(a) arcsin(a) arccos(a) arctan(a) csc(a) sec(a) cot(a)

```
Degrees or Radians:     Degrees or Radians:   Degrees or Radians:
Enter 1 for degrees.    Enter 1 for degrees.  Enter 1 for degrees.
Enter 2 for radians.    Enter 2 for radians.  Enter 2 for radians.
Number:1                Number:1              Number:1
Enter your number: 60   Enter your number: 90 Enter your number: 180


sin = 0.866             sin = 1.000           sin = 0.000
cosin = 0.500           cosin = 0.000         cosin = -1.000
tan = 1.732             tan = 557135115.021   tan = -0.000
arcsin = -nan(ind)      arcsin = -nan(ind)    arcsin = -nan(ind)
arccos = -nan(ind)      arccos = -nan(ind)    arccos = -nan(ind)
arctan = 0.808          arctan = 1.004        arctan = 1.263
sec = 2.000             sec = 557135115.021   sec = -1.000
cosec = 1.155           cosec = 1.000         cosec = 278567557.510
cot = 0.577             cot = 0.000           cot = -278567557.510

continue? (y/n) :       continue? (y/n) :     continue? (y/n) :
```

If 6 is entered, it calculates the output of a polynomial function and the output of its derivative as well.

```
Enter the degree of polynomial equation:
2
Enter the value of x for which the equation is to be evaluated: 3
Enter the coefficient of x to the power 0: 0
Enter the coefficient of x to the power 1: 1
Enter the coefficient of x to the power 2: 2


The value of polynomial equation for the value of x = 3.00 is: 21.00
The value of the derivative of the polynomial equation at x = 3.00 is: 13.00

continue? (y/n) : y
```

If 7 is entered, we have a Pythagorean theorem calculator, where we first enter the missing value, and then we enter the values of the other missing variables.
Hypotenuse (squared) = base (squared) + height (squared)

```
 which missing value is needed to be calculated.
        Enter 1. Hypotinuse
        Enter 2. Base
        Enter 3. Hight
Selection:1
Enter your Values:


base = 12
hight = 16

hypotinuse = 20.000

continue? (y/n) :
```

```
 which missing value is needed to be calculated.
        Enter 1. Hypotinuse
        Enter 2. Base
        Enter 3. Hight
Selection:3
Enter your Values:


base = 12
hypotinuse = 20

hight = 16.000

continue? (y/n) :
```

If 8 is entered, we can find the largest or smallest integer, sorting, calculating average of all inputs in a set of integers of unknown number of values.
This is where the concept of memory allocation was used, pointers was used for this.

```
Enter the number of values: 5
entry 1 : 1
entry 2 : 2
entry 3 : 5
entry 4 : 6
entry 5 : 8
Ascending order = 1.00  2.00    5.00    6.00    8.00
Descending order = 8.00 6.00    5.00    2.00    1.00


Largest Value is 8.00
Smallest Value is 1.00
The sum of the values = 22.000
The average of provided numbers = 4.400


continue? (y/n) :
```

```
Enter the number of values: 10
entry 1 : 125
entry 2 : 635
entry 3 : 854
entry 4 : 256
entry 5 : 2584
entry 6 : 5623
entry 7 : 32587
entry 8 : 254414
entry 9 : 212
entry 10 : 0
Ascending order = 0.00  125.00  212.00  256.00  635.00  854.00  2584.00 5623.00 32587.00        254414.00
Descending order = 254414.00    32587.00        5623.00 2584.00 854.00  635.00  256.00  212.00  125.00  0.00


Largest Value is 254414.00
Smallest Value is 0.00
The sum of the values = 297290.000
The average of provided numbers = 29729.000


continue? (y/n) :
```

If 9 is entered, the program calculates factorial, permutation, and combination of given parameters.

```
Enter A for Factorial.
Enter B for permutation.
Enter C for combination.
 TYPE IN X FOR ALL :  x
Enter n:15
Enter r:10

10! = 3628800
15P10 = 16702583
15C10 = 4

continue? (y/n) :
```

```
Enter A for Factorial.
Enter B for permutation.
Enter C for combination.
 TYPE IN X FOR ALL :  x
Enter n:10
Enter r:10

10! = 3628800
10P10 = 3628800
10C10 = 1

continue? (y/n) :
```

If 10 is entered, the program calculates the distance between the reference point to all the provided points and presents the longest and shortest distances to the reference point.

Structs was covered in this function.

[Unfortunately, this function was not working in Dev C++ but working perfectly in Visual Studio]

```
enter your coordinates:
input x1 coordinate: 0
input y1 coordinate: 159
input x2 coordinate: 0
input y2 coordinate: 365
input x3 coordinate: 2
input y3 coordinate: 2
input x4 coordinate: 0
input y4 coordinate: 14569
input x5 coordinate: 1
input y5 coordinate: 159
input referance coordinate X: 0
input referance coordinate Y: 0
Distance is 159.000 units between points (0.0, 0.0) and points (0.0, 159.0).
Distance is 365.000 units between points (0.0, 0.0) and points (0.0, 365.0).
Distance is 2.828 units between points (0.0, 0.0) and points (2.0, 2.0).
Distance is 14569.000 units between points (0.0, 0.0) and points (0.0, 14569.0).
Distance is 159.003 units between points (0.0, 0.0) and points (1.0, 159.0).

LARGEST Distance is 14569.000 units between points (0.0, 0.0) and points (0.0, 14569.0).

SMALLEST Distance is 2.828 units between points (0.0, 0.0) and points (2.0, 2.0).


continue? (y/n) :
```

```
Enter number of coordinates: 3


enter your coordinates:
input x1 coordinate: 12584112
input y1 coordinate: 12563325
input x2 coordinate: 95958858
input y2 coordinate: 45656565
input x3 coordinate: 21001010
input y3 coordinate: 022321511
input referance coordinate X: 0
input referance coordinate Y: 0
Distance is 17781929.307 units between points (0.0, 0.0) and points (12584112.0, 12563325.0).
Distance is 106266760.355 units between points (0.0, 0.0) and points (95958858.0, 45656565.0).
Distance is 30647875.527 units between points (0.0, 0.0) and points (21001010.0, 22321511.0).

LARGEST Distance is 106266760.355 units between points (0.0, 0.0) and points (95958858.0, 45656565.0).

SMALLEST Distance is 17781929.307 units between points (0.0, 0.0) and points (12584112.0, 12563325.0).


continue? (y/n) :
```

The numbers 11 and 12 are history managers, where 11 displays the history of the system calculator and 12 erases the calculator history.

This part of the code deals entirely with files, continuously printing all outputs into a folder and can be called into the function any time.

The openness of the calculator allows for more versatility in the future allowing for more functions to be added.

The code ::::::::

```
//Mohammad Rauf B2105.010002
//actively working calculator
#include<stdio.h>
#include<math.h>
#include<conio.h>
#include<windows.h>
#include <time.h>

void function1();                                                                                                                             //Function to be called, Function defination bellow, leaving main up
top.
void function2();                                                                                                                             //Function to be called, Function defination bellow, leaving main up
top.
void function3_hexadecimal(int decimal);                                                                          //Function to be called, Function defination bellow, leaving main up top.
void function3_octal(int decimal);                                                                                         //Function to be called, Function defination bellow, leaving main up top.
void function3_binary(int decimal);                                                                                        //Function to be called, Function defination bellow, leaving main up top.
void function4();                                                                                                                             //Function to be called, Function defination bellow, leaving main up
top.
void function5();                                                                                                                             //Function to be called, Function defination bellow, leaving main up
top.
void function6();                                                                                                                             //Function to be called, Function defination bellow, leaving main up
top.
void function7();                                                                                                                             //Function to be called, Function defination bellow, leaving main up
top.
void function8();                                                                                                                             //Function to be called, Function defination bellow, leaving main up
top.
void function9();                                                                                                                             //Function to be called, Function defination bellow, leaving main up
top.
void function10();                                                                                                                            //Function to be called, Function defination bellow, leaving main up
top.
double coordinates_distance(double x, double y, double x2, double y2);     //Function to be called, Function defination bellow, leaving main up top.
long factorial(double num);                                                                                                         //Function to be called, Function defination bellow, leaving main up top.
void history_logger();                                                                                                                        //Function to be called, Function defination bellow, leaving main up
top.
void history_clear();                                                                                                                         //Function to be called, Function defination bellow, leaving main up
top.
int attempt = 3;
int main() {                                                                                                                                           //main function initiation.
        time_t t = time(NULL);
        struct tm* tm = localtime(&t);
        system("COLOR 03");                                                                                                                            //output color set.
        int function;                                                                                                                                  //variable declaration.
        char repeat;                                                                                                                                   //charecter variavle declaration.
        FILE* history;                                                                                                                                 //Folder address assignment.
        history = fopen("History_Depo.txt", "a");                                                                 //opening folder. "a" means open and update.
        printf("\t                                        B2105.010002\n");
        printf("\t                                 Mohammad Raufs Calculator\n");
        printf("\t               Welcome to my active working calculator with extra functions\n\n");
        printf("\t                         Currently active functions are as follows\n\n\n");
        printf("\tEnter 1, for common functions such as addition, subtraction, multiplication and division.\n\n");
        printf("\tEnter 2, for power of and square root functions.\n\n");
        printf("\tEnter 3, for finding the binary, octal, hexadecimal of a given decimal number\n\n");
        printf("\tEnter 4, for Simultanious ax + by = c and quadratic equations equations ax^2 + bx + c.\n\n");
        printf("\tEnter 5, for scientific calculator functions (sin, cosin, tan, arcsin, arccos, arctan, sec, cosec, cot).\n\n");
        printf("\tEnter 6, for differential equation or integration functions.\n\n");
        printf("\tEnter 7, for pythagorian theorem calculator. \n\n");
        printf("\tEnter 8, for finding the largest or smallest integer, sorting, calculating average of \n\t\tall inputs in a set of integers of unknown no. of values.\n\n");
        printf("\tEnter 9, for factorial permutation, combination.\n\n");
        printf("\tEnter 10, for Coordinates corilations and between given number of points.\n\n");
        printf("\tEnter 11, for History.\n\n\tEnter 12, for clearing history.\n\n");
        printf("\nEnter the number of the function that you would like to use: \nFunction: ");
```

```
scanf("%d", &function);                                                                                    //scan user input.
fprintf(history, "%s\n", asctime(tm));                                                    //prints in the folder
fclose(history);                                                                                           //closinf folder.
switch (function) {                                                                                                //checks user entry and performs whatever task accordingly.
case(1): {
         system("cls"); system("COLOR 02");                                                        //output color set.
         function1();                                                                                              //function called.
         break;
}
case(2): {
         system("cls"); system("COLOR 02");                                                        //output color set.
         function2();                                                                                              //function called.
         break;
         }
case(3): {
         system("cls"); system("COLOR 06");                                                        //output color set.
         int decimal;                                                                                              //function called.
         printf("Enter a decimal number: ");
         scanf("%d", &decimal);
         function3_hexadecimal(decimal);
         function3_octal(decimal);
         function3_binary(decimal);
         printf("\n");
         break;
         }
case(4): {
         system("cls"); system("COLOR 06");                                                        //output color set.
         function4();                                                                                              //function called.
         break;
         }
case(5): {
         system("cls"); system("COLOR 06");                                                        //output color set.
         function5();                                                                                              //function called.
         break;
         }
case(6): {
         system("cls"); system("COLOR 06");                                                        //output color set.
         function6();                                                                                              //function called.
         break;
         }
case(7): {
         system("cls"); system("COLOR 06");                                                        //output color set.
         function7();                                                                                              //function called.
         break;
         }
case(8): {
         system("cls"); system("COLOR 04");                                                        //output color set.
         function8();                                                                                              //function called.
         break;
         }
case(9): {
         system("cls"); system("COLOR 04");                                                        //output color set.
         function9();                                                                                              //function called.
         break;
         }
case(10): {
         system("cls"); system("COLOR 04");                                                        //output color set.
         function10();                                                                                             //function called.
         break;
}
```

```
        case(11): {
                system("cls"); system("COLOR F0");                                                      //output color set.
                history_logger();                                                                                       //function called.
                break;
        }
        case(12): {
                system("cls"); system("COLOR 0F");                                                      //output color set.
                history_clear();                                                                                        //function called.
                break;
        }
                default: {
                        printf("Please make a valid entery \n");
                                attempt--;                                                                                              //decrement attempts by 1 units.
                        if (attempt != 0) {
                                        system("cls");
                                        printf("\n\n                                    attempt remaining : %d\n", attempt);
                                        return main();
                        }
                        else {
                                        printf("\n                                      No more attempts remaining.\n");
                                        return 0;
                                        break;
                        }
                }
        }
        history = fopen("History_Depo.txt", "a");                                       //folder address assigned to "history" variable.
        fprintf(history, "\n\n");
        fclose(history);                                                                                        //closing folder.
        printf("continue? (y/n) : ");
        getchar();                                                                                                              //Used this to stop a bug by the compiler.
        scanf("%c", &repeat);
        if (repeat == 'y') {
                system("cls");
                return main();
        }
        printf("                                        Have yourself a good day.\n\n\n");
        return 0;
}

        void function1() {                                                                              //first function declared.
        float num1, num2;                                                                               //input variables declared.
        char op;                                                                                                        //charenter variable declared.
        float result;                                                                                                   //output variable declared.
        FILE* history;                                                                                                  //folder address assigned to "history" variable.
        history = fopen("History_Depo.txt", "a");                                       //opens folder.
        printf("input an operator '+' , '-' , '/' , '*' : ");
        getchar();                                                                                                              //used to prevent a bug by the compiler.
        scanf("%c", &op);
        printf("enter 2 values:\n");
        printf("value 1: "); scanf("%f", &num1);
        printf("value 2: "); scanf("%f", &num2);
        if (op == '+') {
                result = num1 + num2;                                                           //addition.
        }
        else if (op == '-') {
                result = num1 - num2;                                                           //subtraction.
        }
        else if (op == '*') {
                result = num1 * num2;                                                           //multiplication.
        }
```

```
        else if (op == '/') {
                result = num1 / num2;                                                                   //division.
        }
        else {
                printf("please make a valid entry");
                fprintf(history, "Invalid data entry\n");
        }
        printf("The result of %.2f %c %.2f = %.3f \n\n", num1, op, num2, result);
        fprintf(history ,"The result of %.2f %c %.2f = %.3f \n", num1, op, num2, result);
        fclose(history);                                                                                //closes folder.
}
        void function2() {
        FILE* history;                                                                                          //folder address assigned to "history" variable.
        history = fopen("History_Depo.txt", "a");
        int n;
        printf("Enter: \n1. for Power function.\n2. for Square Root function.\nFunction: ");
        scanf("%d", &n);
        switch (n) {
        case (1): {
                double num1;
                int power;
                double result;
                printf("enter a number: ");
                scanf("%lf", &num1);
                printf("enter a power: ");
                scanf("%d", &power);
                result = pow(num1, power);                                                      //using math.h library.
                printf("The %d power of %.2f is equal to %.2f \n", power, num1, result); // prints result on screen.
                fprintf(history, "The %d power of %.2f is equal to %.2f \n", power, num1, result); //prints output in history.
                break;
        }
        case(2): {
                double num1;
                double result;
                printf("enter a number: ");
                scanf("%lf", &num1);
                result = sqrt(num1);                                                            //using math.h library.
                printf("The square root of %.2f is equal to %.2f \n", num1, result);
                fprintf(history, "The square root of %.2f is equal to %.2f \n", num1, result);
                break;
        }
        default: {
                printf("\nfalse entry.\n");
                fprintf(history, "\nfalse entry.\n");
                break;
        }
        }
        fclose(history);                                                                                //closing folder.
}
        void function3_hexadecimal(int decimal) {
                FILE* history;                                                                                  //folder address assigned to "history" variable.
                history = fopen("History_Depo.txt", "a");
                int hexadecimal=decimal;
                int hex_arr[20];                                                                        //Set up an array for hexadecimal values.
                int hex_arr2[20];                                                                       //second array for reversal, msb and lsb.
                int hex_count;                                                                                  //counts total values.
                int hex_remainder;                                                                      //the hexadecimal input.
                int i = 0;                                                                                              //control variable.
                printf("hexadecimal = ");
                fprintf(history, "hexadecimal = ");                                            //prints in file.
```

```
        while (hexadecimal != 0) {
                hex_remainder = hexadecimal % 16;                                       //takes remainder.
                hexadecimal /= 16;                                                              //devider number and takes whole number.
                hex_arr[i] = hex_remainder;                                             //saves the remainders to the array.
                i++;                                                                                    //increment the control by 1 every loop.
        }
        hex_count = i;                                                                                  //saves the number of loops to the a variable to use as main control in out for
loops.
        for (i = 0; i < hex_count; i++) {
                hex_arr2[i] = hex_arr[hex_count - 1 - i];                       //reverses the array for Msb and Lsb.
        }
        for (i = 0; i < hex_count; i++) {
                switch (hex_arr2[i]) {
                case(10): printf("A"); fprintf(history, "A"); break;                                    //hexadecimals rules and prints in file.
                case(11): printf("B"); fprintf(history, "B"); break;                                    //hexadecimals rules and prints in file.
                case(12): printf("C"); fprintf(history, "C"); break;                                    //hexadecimals rules and prints in file.
                case(13): printf("D"); fprintf(history, "D"); break;                                    //hexadecimals rules and prints in file.
                case(14): printf("E"); fprintf(history, "E"); break;                                    //hexadecimals rules and prints in file.
                case(15): printf("F"); fprintf(history, "F"); break;                                    //hexadecimals rules and prints in file.
                default:  printf("%d", hex_arr2[i]); fprintf(history, "%d", hex_arr2[i]);                    //hexadecimals rules and prints in file.
                }
        }
         printf("\n");
         fprintf(history, "\n");
         fclose(history);                                                                               //closing folder.
    }
    void function3_octal(int decimal) {
        FILE* history;                                                                                          //folder address assigned to "history" variable.
        history = fopen("History_Depo.txt", "a");                               //opens and continues input. but doesnt change already available contents.
        int octalNumber = 0;                                                                            //initializing because itll be used in a loop.
        int i = 1;                                                                                              //i should be 1 because anything multiplied with a 0 will
result in a 0.

                while (decimal != 0)                                                                    //untill this condition (decimal != 0) is satesfied, it continues to loop.
                {
                        octalNumber += (decimal % 8) * i;                               //adds the remainder to the decimal place of i.
                        decimal /= 8;                                                                           //number devided by 8 and whole number of result taken.
                        i *= 10;                                                                                //position increased by 1 digit.
                }
        printf("octal = %d\n", octalNumber);
        fprintf(history, "octal = %d\n", octalNumber);
        fclose(history);                                                                                //closing folder.
    }
    void function3_binary(int decimal) {
        FILE* history;                                                                                          //folder address assigned to "history" variable.
        history = fopen("History_Depo.txt", "a");                               //opens and continues input. but doesnt change already available contents.
        int binarynumber[100];                                                                          //Similar concept to hexadecimals. refer to it.
        int i = 1;                                                                                              //Similar concept to hexadecimals. refer to it.
        int remainder;                                                                                          //Similar concept to hexadecimals. refer to it.
        int count;                                                                                              //Similar concept to hexadecimals. refer to it.

        printf("binary = ");                                                                            //Similar concept to hexadecimals. refer to it.
        fprintf(history, "binary = ");                                                          //Similar concept to hexadecimals. refer to it.
        while (decimal != 0) {                                                                          //Similar concept to hexadecimals. refer to it.
                remainder = decimal % 2;                                                        //Similar concept to hexadecimals. refer to it.
                binarynumber[i] = remainder;                                            //Similar concept to hexadecimals. refer to it.
                decimal /= 2;                                                                           //Similar concept to hexadecimals. refer to it.
                i++;                                                                                            //Similar concept to hexadecimals. refer to it.
        }
        count = i;                                                                                              //Similar concept to hexadecimals. refer to it.
```

```
                int reversebin[100];                                                                            //Similar concept to hexadecimals. refer to it.
                for (i = 0; i < count; i++) {                                                           //Similar concept to hexadecimals. refer to it.
                        reversebin[i] = binarynumber[count - 1 - i];                    //Similar concept to hexadecimals. refer to it.
                }
                for (i = 0; i < count-1; i++) {                                                        //Similar concept to hexadecimals. refer to it.
                        printf("%d", reversebin[i]);                                            //Similar concept to hexadecimals. refer to it.
                        fprintf(history, "%d", reversebin[i]);                                  //Similar concept to hexadecimals. refer to it.
                }
                printf("\n");
                fprintf(history, "\n");
                fclose(history);                                                                                //closing folder.
        }
        void function4() {
                FILE* history;
                                        //folder address assigned to "history" variable.
                history = fopen("History_Depo.txt", "a");
        //opens and continues input. but doesnt change already available contents.
                int n;
                printf("Enter 1 for simultanious equations. \nEnter 2 for quadratic equations.\nFunction:");
                scanf("%d", &n);
                switch (n) {
                case(1): {
                        double a, b, c;
                                        //declaration of first function variables.
                        double i, j, k;
                                        //declaration of first function variables.
                        double x, y;
                                        //declaration of x and y variables.

                        printf("Enter the values of coefficents A, B and C, of the first equation of the form Ax+By=C\n");
                        printf("Enter A : ");       scanf("%lf", &a);
                        printf("Enter B : ");       scanf("%lf", &b);
                        printf("Enter C : ");       scanf("%lf", &c);

                        printf("Enter the values of coefficents I, J and K, of the second equation of the form Ix+Jy=K\n");
                        printf("Enter I : ");       scanf("%lf", &i);
                        printf("Enter J : ");       scanf("%lf", &j);
                        printf("Enter K : ");       scanf("%lf", &k);

                        fprintf(history, "Simultanious equations:\na=%f\nb=%f\nc=%f\n\ni=%f\nj=%f\nk=%f\n", a, b, c, i, j, k);          //prints input variables in folder.

                        if (((a * j - i * b) != 0) && ((b * i - j * a) != 0)){                                                                                                  //checks if
the equation is undefined.
                                printf("The solution to the equations is unique\n");
                                fprintf(history, "The solution to the equations is unique\n");
                                x = (c * j - k * b) / (a * j - i * b);
                //the equation moulded to work in any instance the condition is satesfied.
                                y = (c * i - k * a) / (b * i - j * a);
                //the equation moulded to work in any instance the condition is satesfied.
                                printf("The value of x=%.3f\n", x);
                                fprintf(history, "The value of x=%.3f\n", x);
        //prints the result is history.
                                printf("The value of y=%.3f\n\n", y);
                                fprintf(history, "The value of y=%.3f\n\n", y);
        //prints the result is history.
                        }
                        else if (((a * j - i * b) == 0) && ((b * i - j * a) == 0) && ((c * j - k * b) == 0) && ((c * i - k * a) == 0)){  //checks if the equation is undefined.
                                printf("Infinitely many solutions are piossible\n");
                                fprintf(history, "Infinitely many solutions are piossible\n");                                                                          //prints the result is
history.
```

```
                                    printf("The value of x can be varied and y can be calculated according to x's value using relation\n");
                                    fprintf(history, "The value of x can be varied and y can be calculated according to x's value using relation\n");        //prints the result is history.
                                    printf("y=%.3f+(%.3f)x\n\n", (c / b), (-1 * a / b));
                                    fprintf(history, "y=%.3f+(%.3f)x\n\n", (c / b), (-1 * a / b));                                                                                  //prints the result is
history.
                            }
                            else if (((a * j - i * b) == 0) && ((b * i - j * a) == 0) && ((c * j - k * b) != 0) && ((c * i - k * a) != 0)){  //checks if the equation is undefined.
                                    printf("No possible solution\n\n\n");
                                    fprintf(history, "No possible solution\n\n\n");
        //prints the result is history.
                                    break;
                            }
                            break;
                    }
                    case(2): {

                            double a, b, c;
                            double root_check, root1, root2;
                            double real_root, imagenary_root;
                            printf("Enter coefficients A, B and C: \n");
                            printf("Enter A : ");       scanf("%lf", &a);
                            printf("Enter B : ");       scanf("%lf", &b);
                            printf("Enter C : ");       scanf("%lf", &c);
                            fprintf(history, "Quadratic Equations:\nA=%f\nB=%f\nC=%f\n", a, b, c);

                            root_check = b * b - 4 * a * c;                                                                                      //checks for roots.
                            if (root_check > 0) {                                                                                                         //if statement to test.
                                    root1 = (-b + sqrt(root_check)) / (2 * a);                                                          //general quadratic formula for first root.
                                    root2 = (-b - sqrt(root_check)) / (2 * a);                                                          //general quadratic formula for second root.
                                    printf("root 1 = %.3f \n", root1);
                                    printf("root 2 = %.3f \n\n", root2);
                                    fprintf(history, "root 1 = %.3f \n", root1);                                                 //prints result in file.
                                    fprintf(history, "root 2 = %.3f \n\n", root2);                                               //prints result in file.
                            }
                            else if (root_check == 0) {
                                    root1 = root2 = -b / (2 * a);                                                                                 //general quadratic formula for second
root.
                                    printf("x 1 and x 2 is equal to %.3f \n\n", root1);
                                    fprintf(history, "x 1 and x 2 is equal to %.3f \n\n", root1);                       //prints result in file.
                            }
                            else {                                                                                                                                    //imaginary
case.
                                    real_root = -b / (2 * a);                                                                                     //finds the root part that is
calsulatable.
                                    imagenary_root = sqrt(-root_check) / (2 * a);                                                //finds the soefficient of the imaginary part.
                                    printf("first root = %.2lf+%.2lfi and second root = %.2f-%.2fi \n\n", real_root, imagenary_root, real_root, imagenary_root);
                                    fprintf(history, "first root = %.2lf+%.2lfi and second root = %.2f-%.2fi \n\n", real_root, imagenary_root, real_root, imagenary_root); //prints result in file.
                            }
                            break;
                    }
                    default: printf("invalid entry."); fprintf(history, "invalid entry.");
                            break;
                    }
                    fclose(history);                                                                                                                        //closing folder.
            }
            void function5() {
                    FILE* history;                                                                              //folder address assigned to "history" variable.
                    history = fopen("History_Depo.txt", "a");      //opens and continues input. but doesnt change already available contents.
                    int n;
                    double num, radians, degrees;
```

```
                printf("Degrees or Radians: \nEnter 1 for degrees.\nEnter 2 for radians.\nNumber:");
                scanf("%d", &n);
                printf("Enter your number: ");
                scanf("%lf", &degrees);
                switch (n) {
                case(1): {
                        radians= 0.0174532925 * degrees;
                        printf("\n\nsin = %.3f\ncosin = %.3f\ntan = %.3f\narcsin = %.3f\narccos = %.3f\narctan = %.3f\nsec = %.3f\ncosec = %.3f\ncot = %.3f\n\n", sin(radians), cos(radians), tan(radians),
asin(radians), acos(radians), atan(radians), 1 / cos(radians), 1 / sin(radians), 1 / tan(radians));
                        fprintf(history, "\n\nsin = %.3f\ncosin = %.3f\ntan = %.3f\narcsin = %.3f\narccos = %.3f\narctan = %.3f\nsec = %.3f\ncosec = %.3f\ncot = %.3f\n\n", sin(radians), cos(radians),
tan(radians), asin(radians), acos(radians), atan(radians), 1 / cos(radians), 1 / sin(radians), 1 / tan(radians));

                        break;
                }
                case(2): {
                        radians = degrees;
                        printf("\n\nsin = %.3f\ncosin = %.3f\ntan = %.3f\narcsin = %.3f\narccos = %.3f\narctan = %.3f\nsec = %.3f\ncosec = %.3f\ncot = %.3f\n\n", sin(radians), cos(radians), tan(radians),
asin(radians), acos(radians), atan(radians), 1 / cos(radians), 1 / sin(radians), 1 / tan(radians));
                        fprintf(history, "\n\nsin = %.3f\ncosin = %.3f\ntan = %.3f\narcsin = %.3f\narccos = %.3f\narctan = %.3f\nsec = %.3f\ncosec = %.3f\ncot = %.3f\n\n", sin(radians), cos(radians),
tan(radians), asin(radians), acos(radians), atan(radians), 1 / cos(radians), 1 / sin(radians), 1 / tan(radians));

                        break;
                }
                default: {printf("invalid entry.\n\n\n"); fprintf(history, "invalid entry.\n\n\n"); }
                }
                fclose(history);                                                                                        //closing folder.
        }
        /*Function above basically follows the same pattern of the others taking 1 value predetermined if radians or degrees(which then converted in radians) using math.h library to find all of its trig
function results.*/
        void function6() {
                FILE* history;                                                                                                                                                  //folder address
assigned to "history" variable.
                history = fopen("History_Depo.txt", "a");                                                                                       //opens and continues input. but doesnt change already
available contents.
                float x, a[10], y1, dy1, p, d[10], pd = 0, ps;
                int deg, i;
                printf("Enter the degree of polynomial equation: ");                                                    //askes user for degree of polynomial.
                scanf("%d", &deg);
                fprintf(history, "degree of polynomial equation = %d", deg);                                    //prints the value inside of history.
                printf("Enter the value of x for which the equation is to be evaluated: ");
                scanf("%f", &x);
                fprintf(history, "value of X for which the equation is to be evaluated= %f", x);//prints the value inside of history.
                for (i = 0; i <= deg; i++) {
                        printf("Enter the coefficient of x to the power %d: ", i);
                        scanf("%f", &a[i]);
                        fprintf(history, "coefficient of x to the power of %d is %f", i, a[i]);             //prints the value inside of history.
                }
                p = a[deg];

                for (i = deg; i >= 1; i--) {
                        p = (a[i - 1] + x * p);
                }
                y1 = p;

                for (i = 0; i <= deg; i++) {
                        ps = pow(x, deg - (i + 1));
                        d[i] = (deg - i) * a[deg - i] * ps;
                        pd = pd + d[i];
                }
                dy1 = pd;
```

```
		printf("\n\nThe value of polynomial equation for the value of x = %.2f is: %.2f", x, y1);
		printf("\nThe value of the derivative of the polynomial equation at x = %.2f is: %.2f\n\n", x, dy1);
		fprintf(history, "\n\nThe value of polynomial equation for the value of x = %.2f is: %.2f", x, y1);
		fprintf(history, "\nThe value of the derivative of the polynomial equation at x = %.2f is: %.2f\n\n", x, dy1);
		fclose(history);	//closing folder.
	}
	void function7() {
		FILE* history;	//folder address assigned to "history" variable.
		history = fopen("History_Depo.txt", "a");	//opens and continues input. but doesnt change already available contents.
		int n;
		double hypotinuse, base, hight;
		printf("\n\n which missing value is needed to be calculated.\n\tEnter 1. Hypotinuse\n\tEnter 2. Base\n\tEnter 3. Hight\nSelection:");
		scanf("%d", &n);

		printf("Enter your Values:\n\n");
		switch (n) {
		case(1): {
			printf("\nbase = "); scanf("%lf", &base); fprintf(history,"\nbase = %.3f", base);	//takes base input from user and prints it in history.
			printf("height = "); scanf("%lf", &hight); fprintf(history, "\nhight = %.3f", hight);	//takes hight input from user and prints it in history.
			hypotinuse = sqrt(pow(base, 2) + pow(hight, 2));	//calculates hypotinues from the
other two variables.
			printf("\nhypotinuse = %.3f\n\n", hypotinuse);
			fprintf(history, "\nhypotinuse = %.3f\n\n", hypotinuse);
			break;
		}
		case(2): {
			printf("height = "); scanf("%lf", &hight); fprintf(history, "\nhight = %.3f", hight);	//takes hight input from user and prints
it in history.
			printf("\nhypotinuse = "); scanf("%lf", &hypotinuse); fprintf(history, "\nhypotinuse = %.3f", hypotinuse);	//takes hypotinuse input from user and prints it in history.
			base = sqrt(pow(hypotinuse, 2) - pow(hight, 2));
	//calculates base from the other two variables.
			printf("\nbase = %.3f\n\n", base);
			fprintf(history, "\nbase = %.3f\n\n", base);
			break;
		}
		case(3): {
			printf("\nbase = "); scanf("%lf", &base); fprintf(history, "\nbase = %.3f", base);	//takes base input from user and prints it
in history.
			printf("hypotinuse = "); scanf("%lf", &hypotinuse); fprintf(history, "\nhypotinuse = %.3f", hypotinuse);	//takes hypotinuse input from user and prints it in history.
			hight = sqrt(pow(hypotinuse, 2) - pow(base, 2));
	//calculates Height from the other two variables.
			printf("\nhight = %.3f\n\n", hight);
			fprintf(history, "\nheight = %.3f\n\n", hight);
			break;
		}
		default: {printf("\n\nInvalid entry\n\n"); fprintf(history, "\n\nInvalid entry\n\n"); break; }
		}
		fclose(history);	//closing folder.
	}
	void function8() {
		FILE* history;	//folder address assigned to "history" variable.
		history = fopen("History_Depo.txt", "a");	//opens and continues input. but doesnt change already available contents.
		double* ptr;
		int n;
		double temp;
		int i;
		int j;
		printf("\n\nEnter the number of values: ");
		scanf("%d", &n);
		ptr = (double*)malloc(n * sizeof(double));	//memory allocation of an array.
```

```c
        for (i = 0; i < n; i++) {                                                                   //takes number of inputs from the user.
                printf("entry %d : ", i + 1);
                scanf("%lf", &ptr[i]);
                fprintf(history, "entry %d = %.3f\n", i + 1, ptr[i]);            //prints to history.
        }
        for (i = 0; i < n; i++) {                                                                   //ascending sorter.
                for (j = i + 1; j < n; j++) {
                        if (ptr[i] > ptr[j]) {
                                temp = ptr[i];
                                ptr[i] = ptr[j];
                                ptr[j] = temp;
                        }
                }
        }
        printf("Ascending order = ");
        fprintf(history, "Ascending order = ");
        for (i = 0; i < n; i++) {
                printf("%.2f\t", ptr[i]);
                fprintf(history, "%.2f\t", ptr[i]);

        }
        printf("\n"); fprintf(history, "\n");

        for (i = 0; i < n; i++) {                                                           //descending sorter.
                for (j = i + 1; j < n; j++) {
                        if (ptr[i] < ptr[j]) {
                                temp = ptr[i];
                                ptr[i] = ptr[j];
                                ptr[j] = temp;
                        }
                }
        }
        printf("Descending order = "); fprintf(history, "Descending order = ");
        for (i = 0; i < n; i++) {
                printf("%.2f\t", ptr[i]); fprintf(history, "%.2f\t", ptr[i]);
        }
        printf("\n\n\n");
        printf("Largest Value is %.2f\nSmallest Value is %.2f\n", ptr[0], ptr[n - 1]);
        fprintf(history, "Largest Value is %.2f\nSmallest Value is %.2f\n", ptr[0], ptr[n - 1]);

        double average, sum = 0;
        for (i = 0; i < n; i++) {
                sum += (double)ptr[i];
        }
        printf("The sum of the values = %.3f\nThe average of provided numbers = %.3f\n\n\n\n", sum, sum / n);
        fprintf(history, "The sum of the values = %.3f\nThe average of provided numbers = %.3f\n\n\n\n", sum, sum / n);
        fclose(history);                                                                            //closing folder.
}
void function9() {
        FILE* history;                                                                                      //folder address assigned to "history" variable.
        history = fopen("History_Depo.txt", "a");                                   //opens and continues input. but doesnt change already available contents.
        long fact, combination, permutation;
        int r, n;
        char selection;
        printf("\nEnter A for Factorial.\nEnter B for permutation.\nEnter C for combination.\n ");
        printf("TYPE IN X FOR ALL :  ");
        getchar();
        scanf("%c", &selection);
        switch (selection) {
        case('A'):
```

```
        case('a'): {
                printf("Enter r:"); scanf("%d", &r); fprintf(history, "r = %d\n", r);
                fact = factorial(r);
                printf("\nFactorial of %d (%d!) is equal to %d\n\n", r, r, fact);
                fprintf(history, "\nFactorial of %d (%d!) is equal to %d\n\n", r, r, fact);
                break;
        }
        case('B'):
        case('b') : {
                printf("Enter n:"); scanf("%d", &n); fprintf(history, "n = %d\n", n);
                printf("Enter r:"); scanf("%d", &r); fprintf(history, "r = %d\n", r);
                permutation = factorial(n) / factorial(n - r);
                printf("\nThe value of %dP%d is equal to %d\n\n", n,r,permutation);
                fprintf(history, "\nThe value of %dP%d is equal to %d\n\n", n, r, permutation);
                break;
        }
        case('C'):
        case('c') : {
                printf("Enter n:"); scanf("%d", &n); fprintf(history, "n = %d\n", n);
                printf("Enter r:"); scanf("%d", &r); fprintf(history, "r = %d\n", r);
                permutation = factorial(n) / factorial(n - r);
                combination = factorial(r);
                printf("\nThe value of %dC%d is equal to %d\n\n", n, r, permutation/combination);
                fprintf(history, "\nThe value of %dC%d is equal to %d\n\n", n, r, permutation / combination);
                break;
        }
        case('x'): {
                printf("Enter n:"); scanf("%d", &n);
                printf("Enter r:"); scanf("%d", &r);
                permutation = factorial(n) / factorial(n - r);
                combination = factorial(r);
                printf("\n%d! = %d", r, combination);
                printf("\n%dP%d = %d", n, r, permutation);
                printf("\n%dC%d = %d\n\n", n, r, permutation / combination);
                fprintf(history, "\n%d! = %d", r, combination);
                fprintf(history, "\n%dP%d = %d", n, r, permutation);
                fprintf(history, "\n%dC%d = %d\n\n", n, r, permutation / combination);
                break;
        }
        default: {printf("\nFalse entry.\n"); fprintf(history, "\nFalse entry.\n"); }
        }
        fclose(history);                                                                        //closing folder.
}

long  factorial(double num) {
        long long factorial = 1;
        while (num > 0) {
                factorial *= num;
                num--;
        }
        return factorial;
}

double coordinates_distance(double x, double y, double x2, double y2) {
        double distance, xr, yr;
        xr = pow(x2 - x, 2);
        yr = pow(y2 - y, 2);
        distance = sqrt(xr + yr);
        return distance;
}
```

```c
void function10() {
	FILE* history;	//folder address assigned to "history" variable.
	history = fopen("History_Depo.txt", "a");	//opens and continues input. but doesnt change already available contents.
	struct coordinates {
		double x;
		double y;
	};
	struct coordinates point[100], referance_point;
	long double distance[100], control[100], control_2[100];
	int n;
	int i;
	double a, b, c;
	printf("Enter number of coordinates: "); scanf("%d", &n);

	printf("\nEnter your coordinates: \n");
	for (i = 0; i < n; i++) {
		printf("input x%d coordinate: ", i + 1); scanf("%lf", &point[i].x);
		fprintf(history, "input x%d coordinate = %.3f\n", i + 1, point[i].x);	//prints values to history file.
		printf("input y%d coordinate: ", i + 1); scanf("%lf", &point[i].y);
		fprintf(history, "input y%d coordinate = %.3f\n", i + 1, point[i].y);	//prints values to history file.
	}
	printf("input referance coordinate X: "); scanf("%lf", &referance_point.x);
	printf("input referance coordinate Y: "); scanf("%lf", &referance_point.y);
	fprintf(history, "Referance coordinate X=  %.3f\n", referance_point.x);	//prints values to history file.
	fprintf(history, "Referance coordinate Y=  %.3f\n", referance_point.y);	//prints values to history file.

	for (i = 0; i < n; i++) {
		distance[i] = coordinates_distance(referance_point.x, referance_point.y, point[i].x, point[i].y);
	}

	for (i = 0; i < n; i++) {
		a = distance[i];
		printf("Distance is %.3f units between points (%.1f, %.1f) and points (%.1f, %.1f).\n", a, referance_point.x, referance_point.y, point[i].x, point[i].y);
		fprintf(history, "Distance is %.3f units between points (%.1f, %.1f) and points (%.1f, %.1f).\n", a, referance_point.x, referance_point.y, point[i].x, point[i].y);
		control[i] = distance[i];
		control_2[i] = distance[i];
	}
	for (i = 0; i < n; i++) {
		if (control[0] < control[i]) {
			control[0] = control[i];
		}
	}
	printf("\n");
	for (i = 0; i < n; i++) {
		if (control[0] == distance[i]) {
			b = distance[i];
			printf("LARGEST Distance is %.3f units between points (%.1f, %.1f) and points (%.1f, %.1f).\n", b, referance_point.x, referance_point.y, point[i].x, point[i].y);
			fprintf(history, "LARGEST Distance is %.3f units between points (%.1f, %.1f) and points (%.1f, %.1f).\n", b, referance_point.x, referance_point.y, point[i].x, point[i].y);
		}
	}
	for (i = 1; i < n; i++) {
		if (control_2[0] > control_2[i]) {
			control_2[0] = control_2[i];
		}
	}
	printf("\n"); fprintf(history, "\n");
	for (i = 0; i < n; i++) {
		if (control_2[0] == distance[i]) {
			c = distance[i];
```

```
                        printf("SMALLEST Distance is %.3f units between points (%.1f, %.1f) and points (%.1f, %.1f).\n", c, referance_point.x, referance_point.y, point[i].x, point[i].y);
                        fprintf(history, "SMALLEST Distance is %.3f units between points (%.1f, %.1f) and points (%.1f, %.1f).\n", c, referance_point.x, referance_point.y, point[i].x, point[i].y);
                }
        }
        printf("\n"); fprintf(history, "\n");
        fclose(history);                                                                                        //closing folder.
}
void history_logger() {
        FILE* history;                                                                                                  //folder address assigned to "history" variable.
        char filename[100000], c;
        history = fopen("History_Depo.txt", "r");                                       //opens and continues input. but doesnt change already available contents.
        if (history == NULL)
        {
                printf("Cannot open file \n");
                exit(0);
        }
        c = fgetc(history);
        while (c != EOF)
        {
                printf("%c", c);
                c = fgetc(history);
        }
        fclose(history);                                                                                        //closing folder.
}
void history_clear() {
        FILE* history;                                                                                                  //folder address assigned to "history" variable.
        char filename[100000], c;
        history = fopen("History_Depo.txt", "w");                                       //opens and reads folder.
        fclose(history);                                                                                        //closing folder.
}
```