*******************SUM OF $1+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\ldots\frac{1}{n}$ ********************

PROBLEM NO: 01 **DATE: 22/02/2023**

ROLL NO: 1153

- **STATEMENT OF THE PROBLEM:**

Write a C program to calculate the where n is a given positive integer. Compute the sum of $1+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\ldots\frac{1}{n}$ for n=2 ,n=2021 and n=10000.

- **WORKING RULE :**

Step 1 : Read n

Step 2: Set sum=0, i=0

Step 3 : compute sum=sum 1/I

Step 4 : set i=i+1

Step 5 : if i≤n go to step 3

Step 6 : print sum

Step 7 : stop

- **RESULTS :**

SIGNATURE OF THE TEACHER

************ ASCENDING ORDER OF n INTEGERS ***********

PROBLEM NO: 02 **DATE: 06/03/2023**

ROLL NO: 1153

- **STATEMENT OF THE PROBLEM:**

Write a C program to enter n integers into an array and sort the integers in ascending order. Calculate also the number of swap required to sort the given array of integers.

- **WORKING RULE :**

Step 1 : Read n
Step 2: Read x_i $0\le i \le n$

Step 3 : Set i=1

Step 4 : Set j=i+1

Step 5 : If $x_i<x_j$ go to step 7

Step 6 : Interchange x_i and x_j

Step 7 :If j< n set j=j+1 and go to step 5

Step 8 : Print x_i

Step 9 : If I <n-1 set i=j+1 and go to step 4

Step 10: Stop

- **RESULTS :**

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****************NEWTON'S FORWARD INTERPOLATION **************

PROBLEM NO:03 **DATE:09/03/2023**

ROLL NO: 1153

❖ STATEMENT OF THE PROBLEM:

Solve the following interpolation problem.Find f(x) for x=0.20+(R+1)/100 using Newton Gregory Forward interpolation formula.

x	f(x)	x	f(x)
0.20	1.5651272616	0.95	1.7819658019
0.35	1.6062738825	1.10	1.8288130283
0.50	1.6485022329	1.25	1.8768918511
0.65	1.6918407511	1.40	1.9262346485
0.80	1.7363186230	1.55	1.9768746499

in which R denotes last digit of your Roll Number.

❖ WORKING RULE:

NEWTON'S FORWARD INTERPOLATION FORMULA

If y=f(x) is known for (n+1) equally spaced arguments $x_i = x_0 + ih$ (i=0,1,2,3..,n) and $y_i$be the corresponding entries then the Newton's Forward Interpolation Formula with x_0 as the starting point and $u = \frac{x-x_0}{h}$ is

$$f(x) \approx f(x_0) + \binom{u}{1} \Delta f(x_0) + \binom{u}{2} \Delta^2 f(x_0) + \binom{u}{3} \Delta^3 f(x_0) + \dots + \binom{u}{n} \Delta^n f(x_0).$$

❖ RESULTS :

SIGNATURE OF THE TEACHER

************NEWTON'S BACKWARD INTERPOLATION ************

PROBLEM NO: 04 **DATE:16/03/2023**

ROLL NO: 1153

❖ STATEMENT OF THE PROBLEM:

Solve the following interpolation problem.Find f(x) for x=0.20+(R+1)/100 using Newton Gregory Forward interpolation formula.

x	f(x)	x	f(x)
0.20	1.5651272616	0.95	1.7819658019
0.35	1.6062738825	1.10	1.8288130283
0.50	1.6485022329	1.25	1.8768918511
0.65	1.6918407511	1.40	1.9262346485
0.80	1.7363186230	1.55	1.9768746499

in which R denotes last digit of your Roll Number.

❖ WORKING RULE:

NEWTON'S FORWARD INTERPOLATION FORMULA

If y=f(x) is known for (n+1) equally spaced arguments $x_i = x_0 + ih$ (i=0,1,2,3..,n) and y_i be the corresponding entries then the Newton's Forward Interpolation Formula with x_0 as the starting point and $u = \frac{x-x_0}{h}$ is

$$f(x) \approx f(x_0) + \binom{u}{1} \Delta f(x_0) + \binom{u}{2} \Delta^2 f(x_0) + \binom{u}{3} \Delta^3 f(x_0) + \ldots + \binom{u}{n} \Delta^n f(x_0).$$

❖ RESULTS :

SIGNATURE OF THE TEACHER

****************LAGRANGE's INTERPOLATION****************

PROBLEM NO- 05 : **DATE: 22/3/2023**

ROLL NO: 1153

- **STATEMENT OF THE PROBLEM:**

From the following table compute f(x)= 0.29 + (R+3)/100 by Lagrange Interpolation Formula :

x	f(x)
0.24	0.21462
0.30	0.28493
0.42	0.39617
0.50	0.43752
0.61	0.49031
0.69	0.55286
0.83	0.69756

where R denotes the last digit of your Roll Number.

- **WORKING RULE:** **LAGRANGE INTERPOLATION FORMULA**

$$f(x) \simeq L_n(x) = \omega(x) \sum_{r=0}^{n} \frac{f(x_r)}{(x-x_r)\omega'(x_r)} = \omega(x) \sum_{r=0}^{n} \frac{f(x_r)}{D_r}$$

where $\omega(x) = (x-x_0)(x-x_1)(x-x_2)....(x-x_{n-1})(x-x_n)$,

$\omega'(x_r) = (x_r-x_0)(x_r-x_1)..(x_r-x_{r-1})(x_r-x_{r+1})....(x-x_n)$ and

$D_r = (x_r-x_0)(x_r-x_1)..(x_r-x_{r-1})(x-x_r)(x_r-x_{r+1})....(x-x_n)$.

- **RESULT:**

SIGNATURE OF THE TEACHER

****NEWTON DIVIDED DIFFERENCE INTERPOLATION******

PROBLEM NO-06: **DATE : 27/03/2023**

ROLL NO : 1153

❖ **STATEMENT OF THE PROBLEM:**

From the following table compute $f(1.30 + \frac{(R+1)}{100})$ by Newton Divided Difference

x	f(x)
0.24	0.21462
0.30	0.28493
0.42	0.39617
0.50	0.43752
0.61	0.49031
0.69	0.55286
0.83	0.69756

where R denotes the last digit of your Roll Number.

❖ **WORKING RULE:**

NEWTON DIVIDED DIFFERENCE INTERPOLATION FORMULA

$$f(x) \simeq L(x) = f(x_0) + (x - x_0)f(x_0, x_1) + (x - x_0)(x - x_1)f(x_0, x_1, x_2) + (x - x_0)(x - x_1)$$

$$(x - x_2)f(x_0, x_1, x_2, x_3) + ... + ... + (x - x_0)(x - x_1)...(x - x_n)f(x_0, x_1, x_2, ...x_n)$$

where $f(x_0, x_1, x_2, ..., x_n) = \frac{f(x_0,x_1,x_2,...,x_{n-1}) - f(x_1,x_2,...,x_n)}{x_0 - x_1}$.

❖ **RESULT:**

SIGNATURE OF THE TEACHER

****************** TRAPEZOIDAL RULE ********************

PROBLEM NO: 07 **DATE: 01/04/2023**

ROLL NO : 1153

❖ STATEMENT OF THE PROBLEM:

Evaluate the following integral by Trapezoidal rule correct upto 3D using 13 ordinates.

$$\int_{10^\circ}^{50^\circ} \frac{dx}{(1 + a\sin^4 x)^{\frac{3}{2}}}$$

Here b = $\frac{1+R}{20}$,

Where R denotes the last digit of your roll number.

❖ WORKING RULE: TRAPEZOIDAL RULE

Composite Trapezoidal rule for number of ordinates $(n+1) \geq 3$:

$$I_T^C = \frac{h}{2}[(y_0 + y_n) + 2(y_1 + y_2 + y_3 + \ldots + y_{n-1})]$$

where h is the width of each subinterval and y_i is the ordinate at $x_i = x_0 + ih$, (i=0,1,... ,n).

❖ RESULT :

SIGNATURE OF THE TEACHER

************************SIMPSON'S $\frac{1}{3}$ RULE**********************

PROBLEM NO-08 : **DATE: 05/04/2023**

ROLL NO: 1153

❖ STATEMENT OF THE PROBLEM:

Compute the value of the following integral correct to 5D by Simpson's Rule $\frac{1}{3}$ using 13 ordinates:

$$\int_q^4 \frac{q + 2x^2 + x^3}{1 + x\cosh(x + 1)}dx$$

Where q = $\frac{2+R}{10}$

Where R denotes last digit of Roll Number.

❖ WORKING RULE: SIMPSON'S $\frac{1}{3}$ RULE

Composite Simpson's $\frac{1}{3}$ rule for odd number of ordinates $n + 1 \geq 3$ where n is a multiple of two is:

$$I_S^C = \frac{h}{3}[(y_0 + y_n) + 4(y_1 + y_3 + y_5 + ... + y_{n-1}) + 2(y_2 + y_4 + y_6 + ... + y_{n-2})]$$

where h is the width of each subinterval and y_i is the ordinate at $x_i = x_0 + ih$(i=0,1. ... ,n).

❖ RESULT:

$I_S^C =$ (correct up to 5 decimal place).

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***********************WEDDLE'S RULE************************

PROBLEM NO: 09 **DATE: 06/04/2023**

ROLL NO: 1153

- **STATEMENT OF THE PROBLEM:**

Compute the value of the following integral correct to 5D by Weddle's Rule using 13 ordinates:

$$\int_{20^\circ}^{40^\circ} \frac{dx}{(1 - a\sin^2 x)^{\frac{3}{2}}}$$

Where $a = \frac{(1+R)}{10}$.

R denotes the last digit of roll number.

- **WORKING RULE:** **WEDDLE'S RULE**

Composite Weddle's rule for 13 ordinates :

$I_W^C = \frac{3h}{10}[(y_0+y_{12})+5(y_1+y_5+y_7+y_{11})+ (y_2+y_4+y_8+y_{10})+6(y_3+y_9)+2y_6]$

where h is the width of each subinterval and y_i is the ordinate at $x_i = x_0 + ih$,(i=0,1. .. ,12).

- **RESULT:**

$I_W^C =$ (correct up to 5 decimal place).

SIGNATURE OF THE TEACHER