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Newton’s Divided Difference Formula:-

First creating the dd[8][8] matrix whose first column stores the values of y = sin^2(x), and a[8] stores the values of x.
Then filling rest of the elements of d[8][8] by using the formula:-

Divided difference formula

$$DD = \frac{DD(i+1, j-1) - DD(i, j-1)}{x(i+j-1) - x(i)}$$

And

$$f(X) = f(x_1) + \sum_{i=1}^{n} \prod_{j=1}^{i} (X - x_j) DD_i$$

The full code is :-

```cpp
#include<iostream>
#include<string>
#include<math.h>
using namespace std;

int main(){
    float dd[8][8];
    float a[8];
        for(int i=0;i<9;i++){
            a[i] = 2*M_PI*i/8 ;
        }
    for(int i=0;i<8;i++){
        dd[i][0] = pow(sin(a[i]),2);
    }
    float c2,c1;
    for(int j=1;j<8;j++){
        for(int i=0;i<8-j;i++){
            c1 = dd[i+1][j-1]-dd[i][j-1];
            c2 = a[i+j]-a[i];
            dd[i][j] = c1/c2;
        }
    }
    cout<<endl;
    cout<<"The divided difference Matrix is :"<<endl;
    for(int i=0;i<8;i++){
        for(int j=0;j<8;j++){
            cout<<dd[i][j]<<" ";
        }
        cout<<endl;
    }
    float x;
    cout<<"Enter x : ";
    cin>>x;
    float sum=0;
    for(int i=1;i<8;i++){
        float s = 1;
        for(int j=0;j<i;j++){
            s=s*(x-a[j]) ;
        }
        sum = sum + s*dd[0][i];
    }
    sum = sum + dd[0][0];

    cout<<"The value of f(x) at x = "<<x<<" is :  "<<sum;

    }
```

The divided difference matrix is :-

```
The divided difference Matrix is :
0 0.63662 -7.5891e-08 -0.344016 0.219008 -0.0557698 2.37159e-09 0.00430527
0.5 0.63662 -0.810569 0.344016 -1.89727e-08 -0.0557698 0.0236694 0
1 -0.63662 7.5891e-08 0.344016 -0.219008 0.0557698 0 0
0.5 -0.63662 0.810569 -0.344016 -3.79455e-08 0 0 0
7.64274e-15 0.63662 3.79455e-08 -0.344016 3.72232e-23 2.14469e-10 0 0
0.5 0.63662 -0.81057 2.14469e-10 4.02608e-37 1.4013e-45 0 0
1 -0.63662 0 0 0 0 0 0
0.5 1.4013e-45 3.6906e-37 1.4013e-45 4.02611e-37 1.4013e-45 2.21435e+27 1.4013e-45
```

The value of f(x) at x = ∏/3 is :-

```
Enter x : 1.047
The value of f(x) at x = 1.047 is :  0.761092
```

Result of Lagrange is :-

```
Enter x : 1.047
The value of f(x) at x = 1.047 is :  0.761092
```

Hence the value of f(x) at x = ∏/3 is same in both the methods Lagrangian and Newton divided difference.