

An algorithm in pseudocode for implementing Newton's divided-differences follows.

Newton's Divided-Difference

To obtain the divided-difference coefficients of the interpolatory polynomial $P(x)$ on the $(n + 1)$ distinct numbers x_0, x_1, \dots, x_n for the function f :

INPUT numbers x_0, x_1, \dots, x_n ; values $f(x_0), f(x_1), \dots, f(x_n)$ as $F_{0,0}, F_{1,0}, \dots, F_{n,0}$.

OUTPUT the numbers $F_{0,0}, F_{1,1}, \dots, F_{n,n}$ where

$$P(x) = \sum_{i=0}^n F_{i,i} \prod_{j=0}^{i-1} (x - x_j).$$

Step 1 For $i = 1, 2, \dots, n$

For $j = 1, 2, \dots, i$

$$\text{set } F_{i,j} = \frac{F_{i,j-1} - F_{i-1,j-1}}{x_i - x_{i-j}}.$$

Step 2 OUTPUT $(F_{0,0}, F_{1,1}, \dots, F_{n,n})$; ($F_{i,i}$ is $f[x_0, x_1, \dots, x_i]$.)

STOP. ■

MAPLE. See [divideddiffalg.mw](#) or [divideddiffalg.pdf](#) for the implementation of this pseudocode as a Maple procedure. To use the algorithm in problem solving, see [dd.mw](#) or [dd.pdf](#).