Algorithm: Linear Interpolation

Steps

1. **Start**
2. **Read** the values x_0, y_0, x_1, y_1, x
3. **Check for division by zero**
   - If $x_0 = x_1$,
     - Display error message:

       "*x_0 and x_1 cannot be the same*"
     - **Stop**
4. **Check interpolation range**
   - If $x < \min(x_0, x_1)$ or $x > \max(x_0, x_1)$,
     - Display warning:

       "*x is outside the interpolation range*"
5. **Compute interpolated value** using the linear interpolation formula:

$$y = y_0 \frac{x_1 - x}{x_1 - x_0} + y_1 \frac{x - x_0}{x_1 - x_0}$$

6. **Return** the value y
7. **Stop**

Algorithm: Lagrange Interpolation

Step 1: Start

Step 2: Read the arrays of data points

- $x\_points = \{x_0, x_1, \ldots, x_{n-1}\}$
- $y\_points = \{y_0, y_1, \ldots, y_{n-1}\}$
  and the interpolation point x

Step 3: Check whether the number of x_points is equal to the number of y_points

- If not equal, print an error message and stop

Step 4: Set

- $n \leftarrow$ number of data points
- $result \leftarrow 0$

Step 5: For each data point $i = 0$ to $n - 1$, do the following:

- Initialize
  $term \leftarrow y_i$

Step 6: For each $j = 0$ to $n - 1$:

- If $j \neq i$, update

$$term \leftarrow term \times \frac{x - x_j}{x_i - x_j}$$

Step 7: Add the computed term to the result:

$$result \leftarrow result + term$$

Step 8: Repeat Steps 5–7 for all values of i

Step 9: Output the final interpolated value $result$

Step 10: Stop

Mathematical Form Used

$$P(x) = \sum_{i=0}^{n-1} y_i \prod_{\substack{j=0 \\ j \neq i}}^{n-1} \frac{x - x_j}{x_i - x_j}$$