13. **Evaluation of the Legendre Polynomial $P_n(X)$ by Recursion**

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- **comment**
  This procedure computes the Legendre polynomial $P_n(X) = (1/(2^n \times n!)) \times d^n/dX^n(X^2 - 1)^n$ for any given real argument, $X$, and any order, $n$, by the recursion formula below.

- **real procedure**
  ```
  Le(n, X) ;
  n ; real X ;
  a, b, c ; integer i ;
  a := 1 ; b := X ;
  if n = 0 then c := a else if n = 1 then c := b else for i := 1 step 1 until n-1 do
  begin c := b \times X + (i/(i + 1)) \times (X \times b - a) ;
  a := b ; b := c
  end
  Le := c
  end
  ```

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**CERTIFICATION OF ALGORITHM 13**

**LEGENDRE POLYNOMIAL $P_n(x)$** (Galler, *Comm. ACM*, June 1960)

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When transliterated into BALGOL and tested on the Burroughs 220, $Le(n, x)$ gave 7-digit accuracy for $n = 0, 1, 4, 9$ and $X = .01, 2, .7, 1.9, 5.0.$