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

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comment        This procedure computes the Legendre polynomial
               Pn(X) = (1/(2^n × n!)) × 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) ;
integer        n ; real X ;
begin real     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 × X + (i/(i + 1)) × (X × b − a) ;
                a := b ; b := c
               end
               Le := c
               end
```

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.