10. Evaluation of the Chebyshev Polynomial $T_n(X)$ by Recursion

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```
comment     This procedure computes the Chebyshev
            polynomial T_n(X) = cos (n × cos^-1(X)) for
            any given real argument, X, and any order, n,
            by the recursion formula below;
real procedure Ch(n, X) ;
real        X ; integer n ;
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 := 2 step 1 until n do
            begin c := 2 × X × b − a ;
                  a := b ; b := c
            end
            Ch := c
            end
```

CERTIFICATION OF ALGORITHM 10 CHEBYSCHEV POLYNOMIAL $T_n(x)$ (Galler, *Comm. ACM*, June, 1960)

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When transliterated into BALGOL and tested on the Burroughs 220, Ch(n, x) gave better than 7-digit accuracy for n = 0, 1, 4, 8 and x = .01, .2, .7. It gave answers when x > 1 which corresponded to the value of the series with x substituted.