1 SUMMARY

Calculates the coefficients of a polynomial **given** the coefficients of its **expansion in terms of Chebyshev polynomials,** i.e. given a_j, j=0, 1,..., n find b_j, j=0, 1,..., n such that

$$b_0 + b_1 x + ... + b_n x^n \equiv a_0 T_0(x) + a_1 T_1(x) + ... + a_n T_n(x) \qquad n \le 40$$

If the polynomial is known to be an odd or even function the calculation can be simplified and the subroutine can take advantage of this.

ATTRIBUTES — **Version:** 1.0.0. **Types:** `PE01A`; `PE01AD`. **Original date:** June 1963. **Origin:** S.Marlow, Harwell.

2 HOW TO USE THE PACKAGE

2.1 The argument list

The single precision version

        CALL PE01A(A,B,N,NB)

The double precision version

        CALL PE01AD(A,B,N,NB)

A   is a REAL (DOUBLE PRECISION in the D version) array which the user must set to the coefficients of the Chebyshev expansion, i.e. set $A(i+1) = a_i$, i=0, 1, 2,..., n.

B   is a REAL (DOUBLE PRECISION in the D version) array of length at least n+1 in which the subroutine returns the coefficients of the equivalent polynomial, i.e. it sets $B(i+1) = b_i$, i=0, 1, 2,..., n. This argument is not altered.

N   is an INTEGER variable which must be set by the user to n the degree of the polynomial. This argument is not altered. **Restriction:** $n \le 40$.

NB   is an INTEGER variable which must be set by the user to indicate if the polynomial is odd or even. The possible values are:

> 0   if it may not be odd or even,
>
> 1   if it is known to be odd,
>
> 2   if it is known to be even.

The subroutine can perform the calculation in half the normal time if the polynomial is known to be odd or even (NB = 1 or 2).

3 GENERAL INFORMATION

Workspace: None.

Use of common: None.

Other routines called directly: None.

Input/output: None.

Restrictions: $n \le 40$.

4   METHOD

On the first entry to the subroutine the coefficients of the first forty-one Chebyshev polynomials are generated. Consequently execution is fast at subsequent calls.