Mathematica Code

Below is *Mathematica* code for the evaluation of compressed series for e as described in the article to appear in the *College Mathematics Journal* entitled "Improving the Convergence of Newton's Series Approximation for e" by Harlan J. Brothers.

Author address:

Harlan J. Brothers
Brothers Technology
P.O. Box 1016, Branford, CT 06405-8016
Email: harlan@brotherstechnology.com

The following code takes an arbitrary number of terms, shows their compressed simplified form, the summand (with k substituted for n), and the approximate numerical error relative to e.   Here TC represents the number of terms (from Newton's series) to be combined into a single term of the new series while t sets the number of these new terms to be evaluated.

Compressing Series For e :

```
Clear[k]; TC = 1; t = 20;
numerat[1] = 1;
numerat[TC_] := numerat[TC - 1] * (n + TC - 1) + 1;
denominat = (n + TC - 1) !;
summand = Together[Expand[numerat[TC] / denominat]]
expressn = summand /. n → (TC * k)
k = t; acc = Floor[N[-Log[10, expressn]]] + 15;
Print["Error ≈ ", N[E - N[Sum[expressn, {k, 0, t - 1}], acc], acc]]
```

Compressing Series For e^x :

```
Clear[k, x]; TC = 1; t = 20;
numerat[1] = x^n;
numerat[CT_] := numerat[TC - 1] * (n + TC - 1) + x^(n + TC - 1);
denominat = (n + TC - 1) !;
summand = Together[Expand[numerat[TC] / denominat]]
pwexpressn = summand /. n → (TC * k)
x = 1 / 2;
k = t; acc = Floor[N[-Log[10, pwexpressn]]] + 15;
Print["Error ≈ ", N[E - N[Sum[pwexpressn, {k, 0, t - 1}]^(1/x), acc], acc]]
```