where $C_1 = 1 - \gamma$, $\gamma = \lim\left(1 + \frac{1}{2} + \frac{1}{3} + \cdots + \frac{1}{n} - \log n\right)$: Euler's constant

$$C_r = \frac{1}{r}\left(\frac{1}{2^r} + \frac{1}{3^r} + \frac{1}{4^r} + \cdots\right) \quad (r = 2, 3, \cdots).$$

The values of $S_r = \frac{1}{1^r} + \frac{1}{2^r} + \frac{1}{3^r} + \cdots$ and γ were taken from Stieltjes' table.[1] Part of the calculation was done with the assistance of Mr. E. V. HANKAM on an IBM (602-A type) calculating punch. Uhler's radix table was used for getting the antilog of log Γ. The values $\Gamma(\frac{1}{3})$ and $\Gamma(\frac{2}{3})$ were required for calculating the power series coefficients of Bessel functions of order $\frac{1}{3}$ and of functions related to them.

The values were checked by the identity

$$\sqrt{3}\Gamma(\tfrac{1}{3})\Gamma(\tfrac{2}{3}) = 2\pi$$

$$\begin{aligned}
\Gamma(\tfrac{1}{3}) &= 2.67893\ 85347\ 07747\ 63365\ 56929\ 410 \\
\Gamma(\tfrac{2}{3}) &= 1.35411\ 79394\ 26400\ 41694\ 52880\ 282 \\
\log \Gamma(\tfrac{1}{3}) &= .98542\ 06469\ 27767\ 06918\ 71740\ 370 \\
\log \Gamma(\tfrac{2}{3}) &= .30315\ 02751\ 47523\ 56867\ 58628\ 174
\end{aligned}$$

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[1] H. T. DAVIS, *Tables of Higher Mathematical Functions*. v. II, The Principia Press, 1935, p. 244.

Modification of a Method for Calculating Inverse Trigonometric Functions

The 605 programming that I gave recently[1] fails for arguments near $2^{-\frac{1}{2}}$. The reason for this failure is that the double angle formulations used multiply round-off errors until they are intolerably large. These formulations were originally introduced to assure that $\cos 2\theta$ depend on both $\sin\theta$ and $\cos\theta$. Upon closer examination it was found that it is only necessary that $\cos 2\theta$ depend on $\sin\theta$, hence we may use

$$\cos 2\theta = 1 - 2\sin^2\theta.$$

The use of the above formula and

$$\sin 2\theta = 2\sin\theta\cos\theta$$

avoids the errors mentioned and is just as easily programmed for the 605.

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[1] RICHARD L. LA FARA, *MTAC*, v. 8, 1954, p. 132–139.