

$$\begin{aligned}
6\ 76039x^{13} &= 52003P_0 + 2\ 08012P_2 + 2\ 20248P_4 + 1\ 33952P_6 + 50048P_8 \\
&\quad + 10752P_{10} + 1024P_{12} \\
13\ 00075x^{13} &= 2\ 60015P_1 + 4\ 28260P_3 + 3\ 54200P_5 + 1\ 84000P_7 + 60800P_9 \\
&\quad + 11776P_{11} + 1024P_{13} \\
50\ 14575x^{14} &= 3\ 34305P_0 + 13\ 76550P_2 + 15\ 64920P_4 + 10\ 76400P_6 + 4\ 89600P_8 \\
&\quad + 1\ 45152P_{10} + 25600P_{12} + 2048P_{14} \\
96\ 94845x^{15} &= 17\ 10855P_1 + 29\ 41470P_3 + 26\ 41320P_5 + 15\ 66000P_7 + 6\ 34752P_9 \\
&\quad + 1\ 70752P_{11} + 27648P_{13} + 2048P_{15} \\
3005\ 40195x^{16} &= 176\ 78835P_0 + 744\ 37200P_2 + 893\ 24640P_4 + 673\ 17120P_6 \\
&\quad + 352\ 12032P_8 + 128\ 88064P_{10} + 31\ 74400P_{12} + 4\ 75136P_{14} \\
&\quad + 32768P_{16} \\
5834\ 01555x^{17} &= 921\ 16035P_1 + 1637\ 61840P_3 + 1566\ 41760P_5 + 1025\ 29152P_7 \\
&\quad + 481\ 00096P_9 + 160\ 62464P_{11} + 36\ 49536P_{13} + 5\ 07904P_{15} \\
&\quad + 32768P_{17} \\
22687\ 83825x^{18} &= 1194\ 09675P_0 + 5117\ 55750P_2 + 6408\ 07200P_4 + 5183\ 41824P_6 \\
&\quad + 3012\ 58496P_8 + 1283\ 25120P_{10} + 394\ 24000P_{12} + 83\ 14880P_{14} \\
&\quad + 10\ 81344P_{16} + 65536P_{18} \\
44181\ 57975x^{19} &= 6311\ 65425P_1 + 11525\ 62950P_3 + 11591\ 49024P_5 + 8196\ 00320P_7 \\
&\quad + 4295\ 83616P_9 + 1677\ 49120P_{11} + 477\ 38880P_{13} + 93\ 96224P_{15} \\
&\quad + 11\ 46880P_{17} + 65536P_{19} \\
3\ 44616\ 32205x^{20} &= 16410\ 30105P_0 + 71349\ 13500P_2 + 92468\ 47896P_4 + 79149\ 97376P_6 \\
&\quad + 49967\ 35744P_8 + 23893\ 30944P_{10} + 8619\ 52000P_{12} \\
&\quad + 2285\ 40416P_{14} + 421\ 72416P_{16} + 48\ 49664P_{18} + 2\ 62144P_{20} \\
6\ 72822\ 34305x^{21} &= 87759\ 43605P_1 + 1\ 63817\ 61396P_3 + 1\ 71618\ 45272P_5 \\
&\quad + 1\ 29117\ 33120P_7 + 73860\ 66688P_9 + 32512\ 82944P_{11} \\
&\quad + 10904\ 92416P_{13} + 2707\ 12832P_{15} + 470\ 22080P_{17} \\
&\quad + 51\ 11808P_{19} + 2\ 62144P_{21} \\
26\ 30123\ 70465x^{22} &= 1\ 14353\ 20455P_0 + 5\ 03154\ 10002P_2 + 6\ 70872\ 13336P_4 \\
&\quad + 6\ 01471\ 56784P_6 + 4\ 05955\ 99616P_8 + 2\ 12746\ 99264P_{10} \\
&\quad + 86835\ 50720P_{12} + 27224\ 10496P_{14} + 6354\ 69824P_{16} \\
&\quad + 1042\ 67776P_{18} + 107\ 47904P_{20} + 5\ 24288P_{22} \\
51\ 45894\ 20475x^{23} &= 6\ 17507\ 30457P_1 + 11\ 74026\ 23338P_3 + 12\ 72343\ 70120P_5 \\
&\quad + 10\ 07427\ 56400P_7 + 6\ 18702\ 98880P_9 + 2\ 99582\ 49984P_{11} \\
&\quad + 1\ 14059\ 61216P_{13} + 33578\ 80320P_{15} + 7397\ 37600P_{17} \\
&\quad + 1150\ 15680P_{19} + 112\ 72192P_{21} + 5\ 24288P_{23} \\
806\ 19009\ 20775x^{24} &= 32\ 24760\ 36831P_0 + 143\ 32268\ 30360P_2 + 195\ 70959\ 47664P_4 \\
&\quad + 182\ 38170\ 12160P_6 + 130\ 09044\ 42240P_8 + 73\ 46283\ 90912P_{10} \\
&\quad + 33\ 09136\ 89600P_{12} + 11\ 81107\ 32288P_{14} + 3\ 27809\ 43360P_{16} \\
&\quad + 68380\ 26240P_{18} + 10103\ 02976P_{20} + 943\ 71840P_{22} + 41\ 94304P_{24}
\end{aligned}$$

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## A New Approximation to $\pi$

(conclusion)

In *MTAC*, v. 2, p. 320, it was announced that the values of  $\pi$  and  $\tan^{-1} \frac{1}{5}$ , in our previous joint article with Mr. Smith, p. 245-248, called for correction beyond 722D. We are now in a position to guarantee the accuracy of our 808D values of  $\pi$ ,  $\tan^{-1} \frac{1}{5}$ ,  $\tan^{-1} \frac{1}{238}$ ,  $\tan^{-1} \frac{1}{4}$ ,  $\tan^{-1} \frac{1}{20}$ , and  $\tan^{-1} \frac{1}{1988}$ .

This certainty was achieved by Mr. Ferguson carrying through his calculations to 812D, with the independent formula which he had been using. In this way he discovered certain errors in the work of Dr. Wrench.

Dr. Wrench independently discovered another error in his work. Thus 12 digits have to be changed in the previously published value of  $\pi$  in the interval 721D–808D. The correct sequence is as follows:

$\pi =$  ..... 86403 44181 59813 62977 47713 09960  
 51870 72113 49999 99837 29780 49951 05973 17328 16096 31859  
 50244 594(55)

The corrected sequence in  $\tan^{-1} \frac{1}{5}$ , 721D–808D is as follows:

..... 40468 13622 41107 68081 00362 13759  
 92595 89071 66648 51452 55706 79954 88100 43132 95466 83892  
 29036 883(09)

There is no change to be made in Mr. Smith's previously published values of  $\tan^{-1} \frac{1}{3.333}$  to 811D or in Mr. Ferguson's (a)  $\tan^{-1} \frac{1}{4}$ , (b)  $\tan^{-1} \frac{1}{5}$ , (c)  $\tan^{-1} \frac{1}{9.999}$ , each to 710D. We add, however, Mr. Ferguson's values of (a), (b), and (c) 711D–808D.

(a) ..... 59314 07269 83047 72505 80573 53263 40402 52936  
 68088 15266 48595 21663 12393 77666 38170 19070 41862 22868  
 53718 412(24)  
 (b) ..... 66995 11975 27660 30938 09302 51266 37651 02972  
 47760 03233 34506 66330 41815 96327 61997 38784 39560 96639  
 31126 113(14)  
 (c) ..... 35385 21705 44797 37589 88930 29687 78069 65707  
 60943 18995 57207 68639 53447 83160 99985 33336 38876 42719  
 95279 798(75)

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RECENT MATHEMATICAL TABLES

450[A, B, C, D].—DONALD V. MITCHELL, (a) *Six-Place Tables for Precision Computing to accompany* [b] *Streamlined Methods of Computing with Slide Rule and Mathematical Tables* (a) 1945, 47 p., stiff paper cover \$1.00; [b] revised and greatly enlarged ed., 1947, 80 p., stiff paper cover \$1.00, Seattle, Washington, Craftsman Press. 13.5 × 20.5 cm. Procurable from the author, 12345 Sand Point Way, Seattle 55, Wash.

The tables are: Log  $N$ ,  $N = 1000-9999$ , with  $\Delta$ ; the six natural trigonometric functions and their logarithms for each tenth of a degree, with c.d.; decimal equivalents of common fractions;  $N^2$ ,  $N^3$ ,  $N^4$ [4D],  $N^4$ [4D],  $N = 1(1)1000$ . The "Slide Rule Topics" in [b] occupy p. 37–58.

451[A, D].—FRIEDRICH SCHULZE, *Hilfstafeln für die Schrägmessung mit 5 m-Latten und mit dem 20 m. und dem 10 m-Stahlband*. Liebenwerda, Verlag von R. Reiss, 1941 (?) 23 p. 14 × 16 cm. Limp cover. 50 pfennige.

- T. 1,  $\arctan (h/5)$ ,  $h = .1(.01)2.09$ , to the nearest 0'.1.
- T. 2–3,  $Z = (25 - h^2)^{1/2} - 5000$ , and  $0.2Z$ ,  $h = .1(.01)2.09$ ,  $h$  in m. and  $Z$  in mm.
- T. 4–5,  $r = 5000 - 25/(25 + h^2)^{1/2}$  and  $0.2r$ ,  $h = .1(.01)2.09$ .
- T. 6–7,  $Z = 20(\sec \alpha - 1)$  and  $0.05Z$ ,  $\alpha = 0(0^{\circ}.1)24^{\circ}.9$ .
- T. 8–9,  $r = 20(1 - \cos \alpha)$  and  $0.05r$ ,  $\alpha = 0(0^{\circ}.1)24^{\circ}.9$ .