

UNIVERSITY OF ILLINOIS
DIGITAL COMPUTER

LIBRARY ROUTINE N13 - 226

By D. B. Gillies

TITLE Input a Sequence of Fractions, All Having the Same Number of
Decimal Digits. (DOI or SADOI)
TYPE Closed with one program parameter and one pre-set parameter.
NUMBER OF WORDS 21
PRE-SET PARAMETER S3. If during input of the subroutine itself, memory location
3 contains

00 F
00 $\frac{1}{2} 10^m$ F

then m-digit fractions will always be input (for 5D fractions,

00 F
00 50 000 F)

ACCURACY Correctly rounded (error up to $+ 2^{-40}$) $1 \leq m \leq 12$.

SPEED Input time (4 ms per digit) This routine has an inner loop
of 667 μ sec, which makes it twice as fast, overall, as input
routines with one or two multiplications in the inner loop.

USE This routine should be used only when fixed precision fractions
are required. Otherwise use N 12.

To read a sequence of fractions into locations n, n+1, . . .
enter with Q:

50 n
50 q

Each fraction is punched with a sign (+ or -) followed by m
decimal digits. A sequence is terminated by one of N,J,F,L.
When one of these characters is encountered, control is transferred
to the right hand side of q+1, with A = 0, 2^{-39} , 2.2^{-39} , 3.2^{-39}
according as the termination was N,J,F,L. The left hand address
of 15L relative to the subroutine at this time is n+k, if k
words have been read in to locations n, n+1, . . ., n+k-1.

DATE	<u>2/4/57</u>	RT:	<u>3/5/59</u>
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LOCATION	ORDER	NOTES	PAGE 1	N13
0	00 K(NL3) K5 F 42 3L	Plant link and n		
1	46 15L 81 4F	read sign of first fraction of sequence		
2	L0 18L 42 14L	$-1 + (s-10) \cdot 2^{-39}$ set 14' as 0 or 1 for + or -		
3	L0 19L 32 (link)F	If N,J,F,L, A = 0, 1, 2, 3 so obey link		
4	27 7L	Enter digit loop with A=0 (so $n_0 = 0$)		
5	10 3F F4 F 00 2F	$n_{i+1} = (d_i - 10) + 10(1 + n_{i-1})$		
6	F4 F 00 1F			
7	40 F 81 4F	$-1 + 2^{-39} n_i$		
8	L0 18L 32 4L	$-1 + 2^{-39} (d_i - 10)$ loop if $d_i < 10$ (digit, not sign)		
9	40 2F 89 1F	store sign of the <u>next</u> number		
10	L4 F 50 20L	$2^{-39} n$		
11	L0 20L 66 20L	Absolute value of the fraction is		
12	10 1F SJ F	$\frac{2^{-39} (n - \frac{1}{2} 10^m + 2^{-40} 10^m)}{2^{-39} (\frac{1}{2} 10^m)} : \frac{1}{2} + \frac{1}{2} = \frac{n}{10^m} \text{ rounded}$		
13	40 F L1 F	store positively in 0 negatively in 1		
14	40 1F L5 (0 or 1)F	choose 0 or 1 depending on previous sign		
15	40 (n)F L5 15L	store in sequence, and increase		
16	L4 L 46 15L	the address of the store instruction by one		
17	L5 2F 22 2L	$-1 + (s-10) 2^{-39}$ loop		

LOCATION	ORDER		NOTES	PAGE 2	N13
18	80 F 00 10F		$-1 + 10 \cdot 2^{-39}$		
19	80 F 00 2F		$-1 + 2 \cdot 2^{-39}$		
20	00 F 00 S3		$(\frac{1}{2} 10^m) \cdot 2^{-39}$		