TITLE   Integration by Simpson's Rule (Tabulated Values)

TYPE   Closed subroutine

NUMBER OF WORDS   21

TEMPORARY STORAGE   0, 1

ACCURACY $\pm 2^{-39}$ + truncation error

DURATION   1.4n + 3.2 milliseconds

DESCRIPTION   This routine computes an approximation to the integral

$$\frac{1}{b-a} \int_a^b f(x)\, dx \text{ by means of the formula}$$

$$\frac{1}{b-a} \int_a^b f(x)\, dx \sim \frac{1}{3n} (f_0 + 4f_1 + 2f_2 + 4f_3 + \cdots + f_n)$$

where $f_i = f(\frac{[b-a]}{n} i + a)$ is a tabulated function at

an even number n of equally spaced intervals. Entry is made by means of

| q | 50 p F |
	50 qF
q + 1	26 --
	00 nF

where the parameter p is the location of the first tabulated value f_0. The tabulated value f_i must be located in p + i. Control is returned to the left hand side of q + 2 with the result

$$\frac{1}{b-a} \int_a^b f(x)\, dx$$

in the accumulator and also in the quotient register.

NOTE   The limits a and b need not be specified since the result is independent of a linear change of variable.

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LOCATION	ORDER		NOTES	PAGE 1
0	41 F			
	K5 6F			
1	42 2L			
	L4 19L			
2	42 18L		Plant link	
	L5 ( )F			
3	42 F			
	00 19F			
4	42 8L			
	L4 F			
5	42 16L		Set counter	
	L5 F			
6	L4 F		$3n$ in 1	
	L4 F			
7	40 1F			
	41 F			
8	50 19L		$2^{-39} y_0$	
	74 ( )F			
9	L4 F			
	40 F			
10	L5 L			
	L0 20L		Binary switch	
11	42 20L			
	F5 8L			
12	42 8L		Test for end of loop	
	L0 16L			
13	32 15L			
	S5 F			
14	50 20L			
	22 8L			
15	00 F		Waste	
	S5 F			
16	50 19L			
	74 ( ) F		$2^{-39} y_n$	

LOCATION	ORDER		NOTES	PAGE 2
17	L4 F			
	66 1F		Divide by $3n \cdot 2^{-39}$	
18	S5 F			
	26 ( )F			
19	00 F			
	00 1F			
20	00 F			
	00 2F		$2 \cdot 2^{-39}$	

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