

UNIVERSITY OF ILLINOIS
DIGITAL COMPUTER

AUXILIARY
LIBRARY ROUTINE T 1 - 66

TITLE: Sine, Cosine Subroutine (SADOI or DOI)

TYPE: Closed

NUMBER OF WORDS: 30

TEMPORARY STORAGE: 0, 1, 2

ACCURACY: $1/2 \sin x \pm 2^{-39}$ $1/2 \cos x \pm 2^{-39}$
 $1/2 \sin 2x \pm 3.2^{-39}$ $1/2 \cos 2x \pm 3.2^{-39}$

DURATION: 20 milliseconds

RAR: Adjacent to code: 30 if used infrequently
40 if used continually
Adjacent to 1, 2: 40 if used infrequently
50 if used continually

DESCRIPTION: This routine uses A as the argument x and places
 $(\sin x)/2$ in storage location 1
 $(\cos x)/2$ in storage location 2
 $(\sin 2x)/2$ in storage location 0
 $(\sin 2x)/2$ in Q
 $(\cos 2x)/2$ in A.

ENTRY:

p	50 p
p+1	26(T1)

Rt: 7/12/60

DATE	<u>December 2, 1953</u>
CODED BY	<u>Wheeler</u>
APPROVED BY	<u>J. P. Nash</u>

nj

LOCATION	ORDER	NOTES	PAGE 1	T 1
	00K(T1)			
0	40F	argument x to 0		
	S5 20L	}		
1	L4 11L		Set link address	
	42 16L	}		
2	50 F			
	7J F	}	Form x^2	
3	40 1F			
	L5 19L	}	Set up starting values	
4	40 2F			
	50 18L	}		
5	L5 L			
	42 6L	}		
6	7J 1F			
	L4 30L	}		
7	50 2F			
	40 2F	}	Evaluate both power series for $(\sin x)/2$	
8	L5 6L		and $(\cos x)/2$.	
	L4 11L	}		
9	42 6L			
	L0 17L	}		
10	36 6L			
	7J F	}	$(\sin x)/2x \cdot x = (\sin x)/2$	
11	40 1F			
	50 1F	}		
12	75 2F		$(\sin x)/2 \times (\cos x)/2 \times 4$	
	00 2F	}		
13	40 F			
	50 2F	}		
14	75 2F		$(\cos x)/2 \times (\cos x)/2 \times 4 - 1/2$	
	00 2F	}		
15	L0 29L			
	50 F	}		
16	50 F			
	22 F		Return to program	

LOCATION	ORDER	NOTES	PAGE 2	T 1
17	3J 3F 44 30L	End constant		
18	NOF 00 4999 9998 7606 J	$a_{11} = -1/(2 \times 11!)$		
19	NOF 00 4999 9986 4789 J	$a_{10} = -1/(2 \times 10!)$		
20	00F 00137 7805 J	$a_9 \overset{\sim}{=} + 1/(2 \times 9!)$		
21	00F 0012 3985 49J	$a_8 \overset{\sim}{=} + 1/(2 \times 8!)$		
22	NOF 00 4999 0079 3658 J	$a_7 = -1/(2 \times 7!)$		
23	NOF 00 4993 0555 6356 J	$a_6 = -1/(2 \times 6!)$		
24	00F 0041 6666 6667J	$a_5 = +$		
25	00F 00 208 3333 3233 J	$a_4 = +$		
26	NOF 00 4166 6666 6667 J	$a_3 = -$		
27	FO F 00 1F	$+ a_2 = -$		
28	40 F 00 F	$a_1 = +$		
29	40 F 00 F	$a_0 = +$		

NOTE:

The coefficients a_0 to a_{10} are modified to take into account the higher terms in the series.