

UNIVERSITY OF ILLINOIS  
DIGITAL COMPUTER LABORATORY

ILLINOIS CODE M 8 - 151

**TITLE:** Sums of Squares of Rows and Columns (DOI Only)  
**TYPE:** Entire Program, includes DOI  
**DURATION:** Forms the sums of squares of rows and columns of a matrix. The user needs to punch the parameter and matrix tapes as indicated below and to make a copy of the program tape.  
**METHOD OF USE:** (1) Input program tape  
(2) Input parameter tape  
(3) Input matrix tape; will stop reading at end of each column, so input matrix tape on "stop disable" if entire matrix is on one tape. Sums of squares of rows and then sums of squares of columns are punched.

PREPARATION OF TAPES:

**PROGRAM TAPE:** See appended set of orders.  
**PARAMETER TAPES:** Let (d): number of places in printed results  
(r) number of rows in the matrix  
(c): number of columns in the matrix

The parameter tape is punched as follows:

spaces

00 3K

00 (d)F 00 F

00 5K

00 (r)F 00 (r)F

00 7K

00 (c)F 00 (c)F

24 12N

spaces

**MATRIX TAPE:** The matrix is punched by columns, each element being in the form required by Illinois Code N. 3 - 23,

Decimal Number Input. Each element should be scaled sufficiently to prevent overflow. Each column should be terminated by the character "N". The capacity of the routine is defined by the relation  $2r + c < 920$ .

COMMENTS

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Retyped: 9/24/59

LOCATION	ORDER		NOTES	PAGE 1 M 8
	Code X1 00 24K		Decimal Order Input	
	Code N3 00 3K		Decimal Number Input	
0	00 1F 00 1F		Counting constant	
1	50 (100)F by 73F 7J (100)F by 73F		Testing constant	
	00 6K 00 F 00 F 00 8K			
0	L5 (100)F by 77F 00 F		Testing constant	
1	26 64F 0F F 00 45K		Substitute word	
0	40 100F fr. 32L, 18L 50 L		Read a column of numbers $m_{ij} \quad j = 1, \dots, r$	
1	26 24F 00 1F from 11L			
2	50 (100)F by 9L, 12L 7J (100)F by 9L, 12L		$m_{ij}^2 \rightarrow 0$	
3	40 F 26 4L (waste)			
4	L4 (100)F by 18L 40 (100)F by 18L		increase jth column sum	
5	22 5L (waste) L5 F			
6	L4 (100)F by 28L, 8L, 14 L 40 (100)F by 29L, 8L 14L		increase ith row sum	

LOCATION	ORDER	NOTES	PAGE 2	M 8
7	L5 6L L4 3F			
8	40 6L L5 2L			
9	L4 3F 40 2L			
10	L0 4F 32 11L			
11	22 1L L5 2L	fr. 10L		
12	L0 5F 40 2L			
13	L5 6L L0 5F			
14	40 6L L5 6F			
15	L4 3F 40 6F			
16	L0 7F 36 19L			
17	L5 4L L4 3F			
18	40 4L 24 0L			
19	L5 (100)F 50 19L	fr. 26L fr. 16L, 23L, by 19L, 29L		
20	26 10F L5 19L			
21	L4 3F 46 19L			
22	L0 8F 32 23L			
23	26 19L (92 177F)	fr. 22L, by 26L		

increase addresses of row sum

increase addresses of column element

test for end of column

reset addresses of column element  
to that of  $m_{0j}$

reset addresses of row sum to that  
of  $M_0$

increase column counter

test for last column

increase addresses of column sum

start a new column

print the  $i$ th row sum  
 $j$ th column sum

increase addresses of ( $^{row}$   
column) sum

test for last ( $^{row}$   
column)

back to finish punching ( $^{row}$   
column) sums  
punch ten line-feed characters

LOCATION	ORDER	NOTES	PAGE 3	M 8
24	L5 8F L4 7F			
25	46 8F L5 9F			
26	40 23L 24 19L			
27	L5 5F L4 4F			
28	40 4F 46 6L			
29	42 6L 46 19L			
30	L5 5F L4 5F			
31	L4 4L 40 4L			
32	46 8F 26 L 00 10K			
0	50 ( )F 50 0L			
1	26 78F 22 65F			
2	L5 3F 46 0L			
3	19 57F K5 F			
4	40 3F 92 47F			
5	92 143F 26 72F 00 78K Code P2 00 970K Code X7 24999N			

plant address of  $M_{.0}$  in 8F

replace 92 order with 0F order  
stop; then start punching row sums

plant addresses in test constant

set first column sum address

set first row sum address      set  
dependent

start program      parameters

by 2L

print a row or column sum

return to body

plant number of digits to  
be printed

plant  $(1)_0$  at 3

punch 12 delay characters  
punch 4 line-feed characters  
start reading and summing squares  
after forming dependent parameters

Decimal Fraction Print Routine

Memory Sum Check