

UNIVERSITY OF ILLINOIS
DIGITAL COMPUTER LABORATORY
STATISTICAL LIBRARY

KSL 5.30 - 259

TITLE: Matrix Transposition with or without Rescaling (SADOI Only)

TYPE: Entire program

DURATION: About .25 R x C seconds where R is the number of rows and C is the number of columns

DESCRIPTION: The routine will transpose a matrix, or rescale a matrix, or both rescale and transpose a matrix. The matrix may be multiplied by 10^{-2} , 10^{-1} , 10^{+1} , or 10^{+2} . The form of output, with respect to its appearance on the teletype page, may be in column form, in row form, or in row form with a space separating elements.

CAPACITY:

1. Transposition with or without rescaling
 - a. $R \times C \leq 10240$
 - b. Neither R nor C may exceed 775 elements
2. Rescaling groups of numbers
 - a. The number of elements in a group may not exceed 814
 - b. The number of elements in successive groups need not be the same
 - c. The number of groups is unlimited

METHOD OF USE:

	<u>Stops</u>
1. Master tape	340F8
2. Parameter tape	240F8
3. Data tape	240F8

To operate on an additional data tape using the same parameters at stop 240F8, insert the data tape in the reader and raise the black switch.

To change the parameters at stop 240F8, insert the new parameter tape and raise the white switch. Next insert the data tape and raise the black switch.

PARAMETER TAPE:

There are four parameters. These must be punched in the following order: d space X S P.

"d" is the number of decimal places in the results. This parameter must be followed by a fifth hole character.

The number, d, must be in the range, $1 \leq d \leq 11$.

The directive, X has the following meaning:

if X = 0, the matrix will be transposed;

if X = 1, the set of numbers will be rescaled;

if X = 2, the matrix will be transposed and rescaled.

The scaler, S, should be omitted if X = 0. Otherwise, S may have the following values:

- if S = + 2, the elements will be multiplied by 10^{+2} ;
- if S = + 1, the elements will be multiplied by 10^{+1} ;
- if S = - 1, the elements will be multiplied by 10^{-1} ;
- if S = - 2, the elements will be multiplied by 10^{-2} ;

The parameter, P, determines the print format on the teletype page as follows:

- if P = N, the output appears printed by columns;
- if P = J, the output appears printed by rows;
- if P = F, the output appears by rows with a space separating elements.

DATA TAPE:

The data tape must be prepared with an N terminating each row (or column) and with an N and a J after the final row. Each element must be punched as a signed fraction and may contain as many as 12 digits.

For transposition, the number of elements in each row must be equal; otherwise the computer will stop on order 4F from location 033. For scaling only, the number of elements in successive groups need not be the same.

If the character, F, terminates a group instead of an N, the computer will stop. Raising the black switch will start the computer again.

NOTE:

If the computer stops on FF from location 100 after reading the master tape, this indicates a sum check failure. Clear machine and reread the master tape.

DATE	March 12, 1959
SUBMITTED BY	J. Hurley + K. Dickman
APPROVED BY	<i>J. Snyder</i>

LOCATION			ORDER	NOTES	PAGE 1
Abs.	Rel.	Sym.			
			004K		
4		(N)	00F 00F	by 38F	Number in each group
5		(G)	00F 00F	by 31F	Number of groups
6		(SC)	00F 00F	by 250F	Scaler
			OOK		
7		(K)	00F 000000 7812 5000J		$10^{-2} \times 2^{-7}$
8			00F 000007 8125 0000J		$10^{-1} \times 2^{-7}$
9		(K9)	00F 00(K9)		
10			00F 000781 2500 0000J		$10^1 \times 2^{-7}$
11			00F 007812 5000 0000J		$10^2 \times 2^{-7}$
12		(DR)	8611F 002560F		
13		(DP)	8511F 002560F		
14		(I)	00F 001F		
15		(L)	00F 40(Y)		Store of vector at (Y)
16		(I2)	S2(T1) 50F	by 97F	
17		(K1)	26(P16) 92963F		} Print format
18		(K2)	26(P16) 92131F		
19		(K3)	26(P16) 26(X8)		
20		(K4)	26(P16) 26(A11)		
21		(K5)	00F 00F		
22		(K6)	S2(X4) 50F		
23		(K7)	NFF L5F	by 37F, by 98F	
24		(K8)	S2(A3) 40F	by 97F	
25		(K10)	00F 0010F		
26		(K11)	36(A2) 26(A4)		} Directive
27		(K12)	92139F 26(X)		
28		(K13)	92139F 26(DI)		
29		(K14)	36(A2) 26(T)		
30		(K15)	26(P16) 26(T4)		
			OOK		
31		(DI)	41(N) 41(G)	from 235F	For transposition, read and store on drum
32			L5(L) 42(D7)		
33			L5(DR) 40(D8)		
34		(D1)	50(Y) 50(D1)		

LOCATION			ORDER	NOTES	PAGE 2
Abs.	Rel.	Sym.			
35			26(N12) L0(1)		Read first vector
36		(D2)	30(D2) L521(N12)		Stop if F
37			1020F 42(K7)		
38			L0(L) 42(N)		
39		(D7)	50(D7) 50(G)	from 57F	
40			75(N) 85F		
41			L4(DR) 40(D8)		
42		(D4)	50(Y) 50(D4)		
43			26(N12) L0(1)		Read subsequent vectors
44			30(D6) 32(D6)		
45		(D5)	L0(L) 30(D6)		Stop on F
46		(D6)	26(A) 15(L)		
47			30(D7) 1521(N12)		
48			1020F L0(L)		
49			30(X) 40F		
50			10F 30(D7)		
51		(D8)	10F 10F	by 32F	Stop on 4F if vectors are
52		(D8)	10F 10F	by 33F, 41F	unequal
53			75(D8) 40(D8)		
54			75(D7) 42(D7)		
55			L0(D7) 32(D7)		
56			75(G) 42(G)		
57			41(K5) 22(D3)		
			00K		
58		(X)	L5(SC) L4(K9)	from 235F	Rescale only
59			0020F 46(X5)		
60		(X1)	50(Y) 50(X1)		
61			26(N12) L0(1)		
62			36(X2) 22(X3)		
63		(X2)	L0(1) 30(X3)		Stop if F
64		(X3)	26(X9) L521(N12)		
65			1020F 42(K6)		
66			L5(L) 42(X4)		

LOCATION			ORDER	NOTES	PAGE 3
Abs.	Rel.	Sym.			
67		(X4)	32(X4) 50F		
68		(X5)	75F 36(X10)	by 58F	
69			007F 36(X11)		
70		(X6)	50F 50(X6)	by 243F	
71		(X7)	26(P16) 00F	by 119F, 122F,	OOFF will be set to determine print format
72		(X8)	F5(X4) 42(X4)	126F	
73			L0(K6) 32(X4)		
74			92770F 92131F		
75			92519F 22(X1)		
76		(X9)	92834F 24(DEL)		
77			26(M) 26(M)		
78		(X10)	007F 32(X6)		
79		(X11)	L4(X12) 22(X6)		
80		(X12)	80F 00F		
			00K		
81		(T)	L5(L) 42(T1)	from 104F	
82		(T1)	32(T1) 50F		
83		(T5)	75F 36(T6)	by 93F	
84			007F 36(T7)		
85		(T2)	50F 50(T2)	by 244F	
86		(T3)	26(P16) 00F	by 120F, 124F,	OOFF will be set to determine print format
87		(T4)	F5(T1) 42(T1)	127F	
88			L0(12) 32(T1)		
89			26(A10) 00F		
90		(T6)	007F 32(T2)		
91		(T7)	L4(X12) 22(T2)		
			00K		
92		(A)	L5(SC) L4(K9)	from 46F	
93			0020F 46(T5)		
94		(A1)	L5(DP) L4(K5)		
95			40(A2) L5(L)		
96			42(A3) L4(G)		
97			42(K8) 42(12)		
98			42(K7) 50F		

LOCATION			ORDER	NOTES	PAGE 4	KSL 5.30
Abs.	Rel.	Sym.				
99		(A2)	00F 00F	by 95F	Drum order	
100		(A3)	32(A3) 40F	by 96F		
101			L5(A2) L4(N)			
102			40(A2) F5(A3)			
103			42(A3) L0(K8)			
104		(A9)	36(A2) 00F	by 130F, 133F		
105		(A4)	L5(L) 42(A5)			
106			22(A5) 00F			
107		(A5)	4FF L5F			
108		(A6)	50F 50(A6)	by 243F		
109		(A7)	26(P16) 00F	by 120F, 123F, 127F	00F will be set to determine print format	
110		(A11)	F5(A5) 42(A5)			
111			L0(K7) 32(A5)			
112		(A10)	92770F 92131F			
113			92519F F5(K5)			
114			42(K5) L0(N)			
115			36(A8) 26(A1)			
116		(A8)	92834F 92139F			
117			9259F 24(DEL)		Stop: Black; new data tape	
118			26(M) 26(M)		white; new parameters	
			00K		P = N; print by columns	
119		(E1)	L5(K2) 40(X7)	from 251F		
120			40(A7) 40(T3)			
121			24(DEL) 00F			
			00K		P = J; print by rows	
122		(E2)	L5(K3) 40(X7)	from 253F		
123			L5(K4) 40(A7)			
124			L5(K15) 40(T3)			
125			24(DEL) 00F			
			00K		P = F; print by rows with spaces separating elements	
126		(E3)	L5(K1) 40(X7)	from 252F		
127			40(A7) 40(T3)			
128			24(DEL) 00F			

LOCATION			ORDER	NOTES	PAGE 5
Abs.	Rel.	Sym.			
129		(E4)	OOK L5(KL3) 40(DEL1)	from 246F	X = 0; transposition only
130			L5(KL1) 40(A9)		
131			22(M7) 00F		
132		(E5)	OOK L5(KL3) 40(DEL1)	from 247F	X = 2; both transposition and rescaling
133			L5(KL4) 40(A9)		
134			22(M7) 00F		
135		(E6)	OOK L5(KL2) 40(DEL1)	from 248F	X = 1; rescaling only
136			22(M7) 00F		
137		(N12)	OOK		Input routine
176		(P16)	OOK		Print routine
232		(DEL)	OOK 9259F 9259F	from 121F, 125F, 128F	Read parameters
233			9259F 9259F		
234			9259F 9259F		
235		(DEL1)	92139F 00F	by 129F, 132F, 135F	
236		(M)(ML)	OOK 41F 914F		Plant "d"
237		(M2)	32(M4) 22(M1)		
238		(M3)	914F 32(M4)		
239		(M4)	26(M5) 50F		
240			74(KL0) S5F		
241			40F 26(M3)		
242		(M5)	L5F 0020F		
243			46(A6) 46(X6)		
244			46(T2) 50F		
245			814F L0(1)		
246			36(M6) 26(E4)		
247		(M6)	L0(1) 36(E5)		Read directive, X
248			26(E6) 00F		Read scaler, S
249		(M7)	52(SC) 50(M7)	from 131F, 134F, 136F	

LOCATION			ORDER	NOTES	PAGE 6
Abs.	Rel.	Sym.			
250			26(N12) L0(1)	} Test for N, J, or F	
251			36(M8) 26(E1)		
252		(M8)	L0(1) 36(E3)		
253			26(E2) 00F		
254		(Y)	26(M) 26(M)	Store of data at (Y)	
			00K		
255			L3F 34(M)	Sum check	
256			FFF 26(M)		
257			N02988F 920858F		
			26L 261N		