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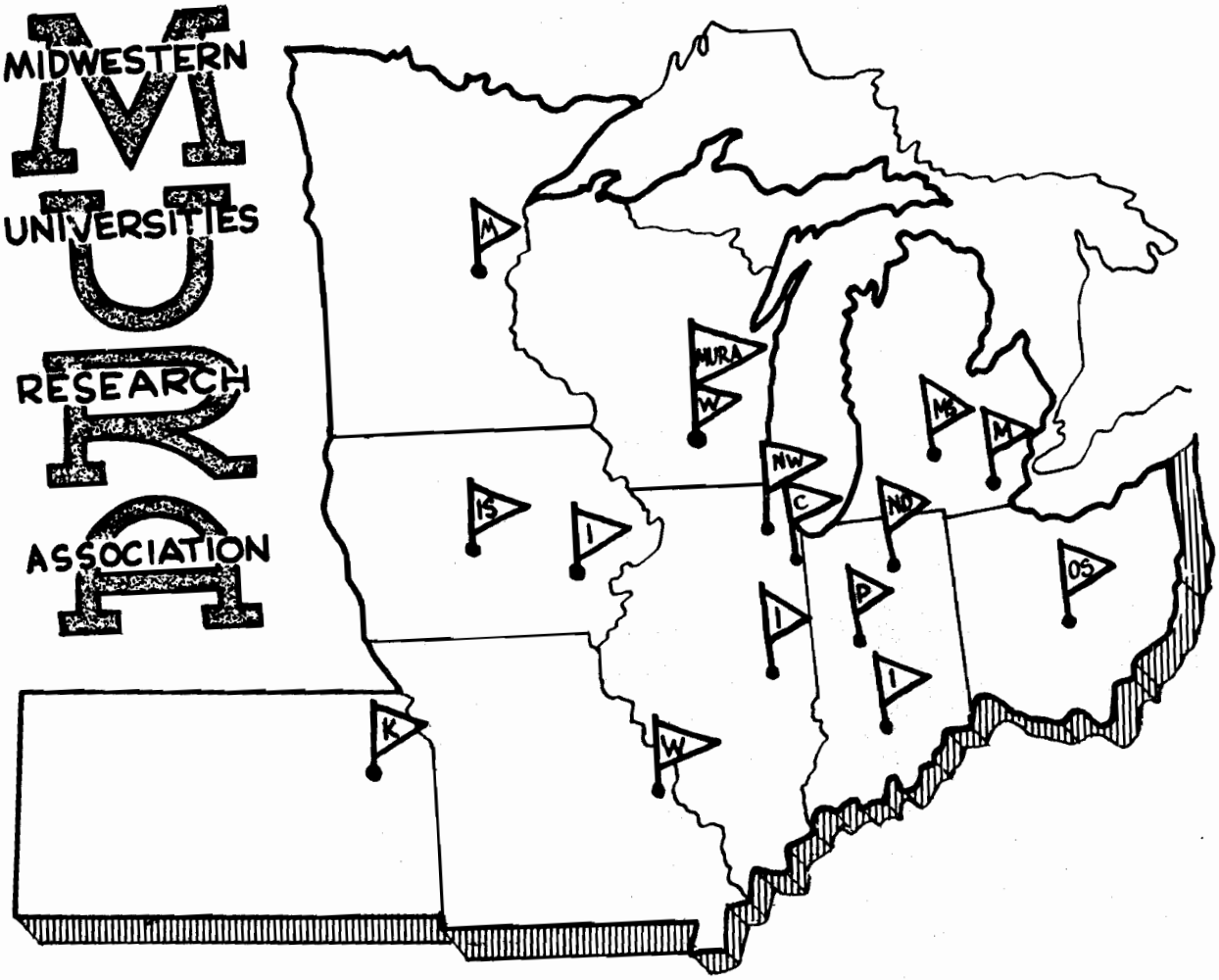

REPORT COILMATE
(Program 172)
January, 1958

NUMBER 382

Internal
(IBM Program)

COILMATE
(Programme 172)

M. R. Storm

This program arose out of a private communication between R. Haxby and M. Storm on January 3, 1958.

In general this routine solves a set of simultaneous linear equations

$$(1) \qquad \sum_{i=1}^{n} a_{ij}x_i = b_{i,\ n+1}$$

where the matrix $A = [a_{ij}]$ is an n x n matrix and b is a single column matrix (i.e., n x 1). In actual use the two matrices A and b are entered as a single combined matrix M as follows:

$$M = \begin{pmatrix} a_{11}, & a_{12}, \ldots a_{1n}, & b_1 \ (n+1) \\ a_{21}, & a_{22}, \ldots a_{2n}, & b_2 \ (n+1) \\ \cdot & & \\ \cdot & & \\ \cdot & & \\ a_{n1}, & a_{n2}, \ldots a_{nn}, & b_n \ (n+1) \end{pmatrix}$$

The elements of the M matrix are stored <u>rowwise</u> into consecutive storge locations of the computer's memory. Any elements which are zero, however, must be entered on the agendum sheet. The size of the matrix M is specified on the agendum as two integers m and n, where <u>m</u> is the total number of columns and <u>n</u> is the number of rows.

The elements of the solution will be printed five numbers to a line plus an integer line label at the extreme left. A sample printout is indicated below.

program no.

```
I  00172
I  00172      ID            M             N

   00001  -93661199- 1  60109300- 2  81530053- 1  11748634+ 0  17261153+10
   00002   60109300- 2  00000000000  11748634+ 0  -93661199- 1  17261153- 21
   00003   72108333+ 1  -11602500- 2  -83741436+ 0  00000000000  -93661199- 1

                                                                    END
```

The calculation of the solution is carried out in floating point arithmetic. No checks of accuracy are built in the code and for systems where n is large, the round-off error may be appreciable. A halt and divide check will occur if the matrix A is singular.

In normal operation all sense switches are down. The only sense switch test built in is for switch 1 and is used for stopping the caluclation abruptly by placing it up. Provision has been made for evaluating the determinant and supplying the inverse of the matrix A, but one should consult the author before attempting to submit such a problem.

The preparation of the data numbers on the agendum is done in the following manner. The matrix elements are floating point decimal numbers which are entered rowwise and written in sequence from left to right across the page. Each element consists of a 3 digit decimal number* and a 2 digit exponent. The decimal point is understood to follow immediately after the first digit and minus signs are to be placed above the first character. Plus signs are omitted. As an example, 1.25×10^{-2} will be written as 125 $\bar{0}$2 and -1.25×10^{3} as $\bar{1}$25 03. A sample agendum sheet is attached.

*This limitation exists only as a convenience of the key punchers and is not characteristic of the program. Indeed, a maximum of 8 decimal figures is allowed.

COILMATE ADDENDUM
(Program 172)

INTEGERS

Parameters	Address	Value	Remarks
ID	356	1800000082	HUMAN ID No.
M	357	4	No. of Columns
N	358	3	No. of Rows
		STALE MATE	

Matrix Elements (Floating Point Numbers)

n	exp	n	exp	n	exp	n	exp	n	exp	n	exp	n	exp
$\bar{1}25$	02	270	01	981	03	144	02	346	02	$\bar{6}47$	00	000	00
358	$\bar{1}0$	271	$\bar{0}3$	$\bar{6}22$	01	$\bar{4}02$	01	555	04				