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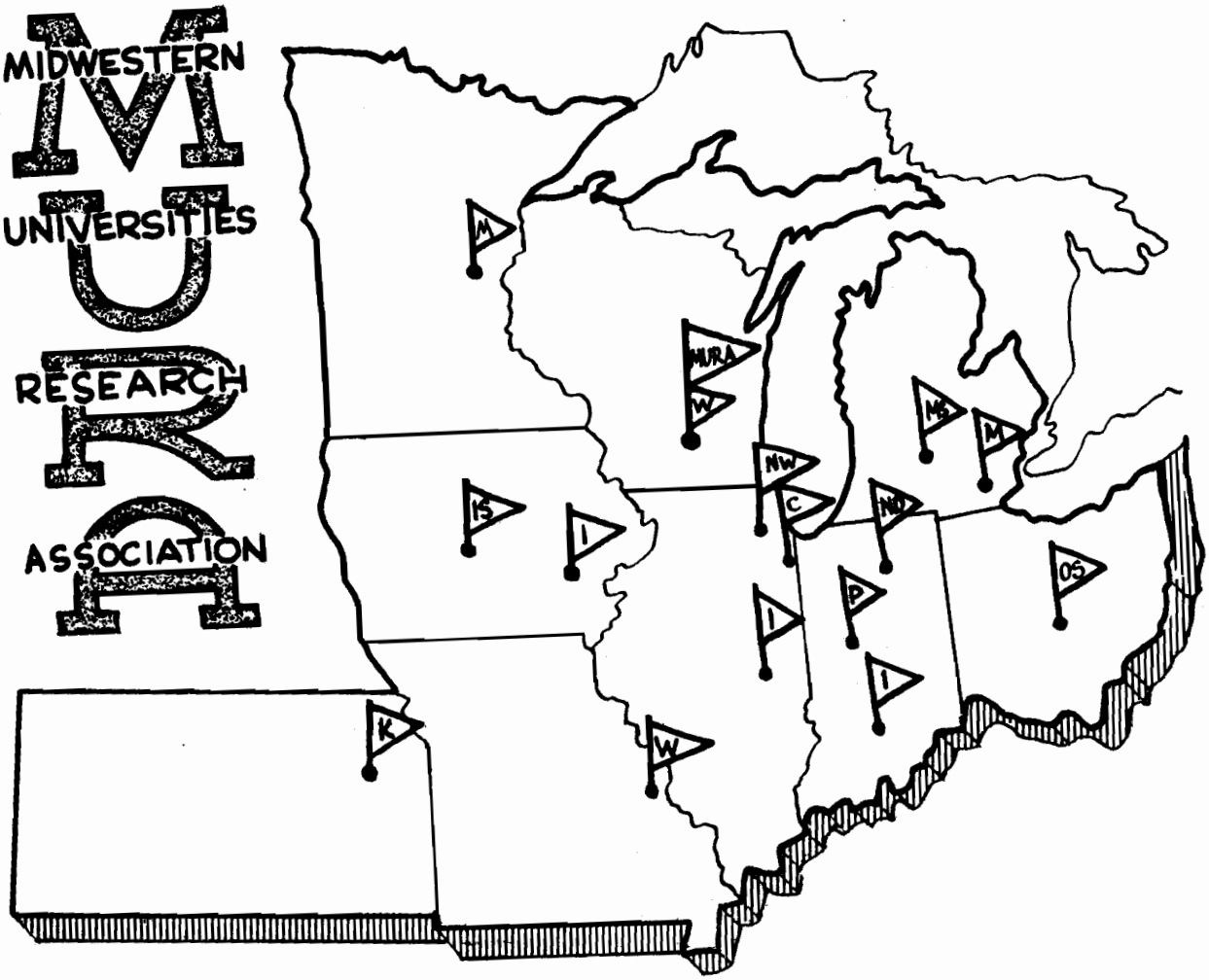

REPORT GRINDERS
(Program 264)
October, 1959

NUMBER 528
Computer Program
Internal

GRINDERS
(Program 264)
Elizabeth Z. Chapman

GRINDERS is a program for the IBM 704 requested by F. E. Mills on October 1, 1959.

This program evaluates the following integral:

$$\theta(h) = \int_1^{h_f} \frac{dh}{\sqrt{2\alpha \ln h - \varepsilon(h^2-1)}}$$

For computing purposes, let $\xi = \frac{2\alpha}{\varepsilon}$, then

$$\theta(h) = \frac{1}{\varepsilon} I$$

where

$$I = \int_1^{h_f} \frac{dh}{\sqrt{\xi \ln h - (h^2-1)}}$$

In evaluating this integral a 3-point Gauss quadrature is performed for each step of size Δh. When the value of I exceeds I_{max}, the evaluation is completed.

The user specifies ε or $\sqrt{\varepsilon}$, ξ, Δh, I_{max}, an ID number, N_p and possibly $(C_p)_0$. At the start of a run the input data is printed in the following format:

	Line #	Col. 1	Col. 2	Col. 3	Col. 4	Col. 5
I	00000	Program #	ID#			
I	00001	N_p	$(C_p)_o$			
	00002	ε *				
	00003	$\sqrt{\varepsilon}$				
	00004	ξ	Δh	I_{max}		

*Line 2 is missing if $\sqrt{\varepsilon}$ is entered and Sense Switch 3 is up.

This program operates in the floating point mode, therefore lines 2, 3, and 4 are printed in this mode. For a more detailed description of input and output in this mode, see L. D. Fosdick, MURA Report #226.

After initial printing two lines are skipped and printing occurs at every N_p^{th} integration step. Each line will contain the following quantities respectively, a five digit decimal line counter, h_f, $\theta(h)$, $\sqrt{\varepsilon[\xi \ln h - (h^2-1)]}$ If the square root computed in $\theta(h)$ is negative, a failure signal of 00001 is printed in the leftmost column of the line. For the $\sqrt{\varepsilon[\xi \ln h - (h^2-1)]}$ negative, a failure signal of 00002 is printed.

A sample agendum sheet is attached.

GRINDERS AGENDUM

(Program 264)

Parameter	Address	Value		Remarks	
ID	2001			Human ID and run number	FIXED POINT INTEGERS
N_p	2002			Number of integration steps between print of h_f, θ (h), $\sqrt{\varepsilon[\xi \ln h - (h^2-1)]}$	
$(C_p)_o$	2003			Initial value of the print counter, C_p	
		n	exp		
ε	2004			SS3 down	FLOATING POINT NUMBERS
$\sqrt{\varepsilon}$	2005			SS3 up	
ξ	2006				
Δh	2007			Integration step size	
I_{max}	2008			Maximum value for $I = \int_1^{h_f} \frac{dh}{\sqrt{\xi \ln h - (h^2-1)}}$	