

UNIVERSITY OF ILLINOIS  
DIGITAL COMPUTER

ILLINOIS CODE V 3 - 101

TITLE A Sequence of Random Numbers with Optional Preparatory Interlude

TYPE Closed

NUMBER OF WORDS 6 temporary  
7 permanent

TEMPORARY STORAGE All internal, location 6 (relative)

DURATION 2n ms on first use where n ( $\sim 1000$ ) is the iterate of the starting number which is chosen as the first member of the sequence  
1.7 ms on subsequent use

RAR 50 on first use. On later use the read around will depend on the frequency of use. If used continually the read around will be 50. (The read around can be decreased by changing word 12 from 

42 5L
22 2L

 to 

42 5L
50 F

)

PRESET PARAMETER S3 which determines the first member of the sequence, n. This parameter is used only if the programmer uses the optional preparatory interlude. (See discussion below).

ENTRY 

p	50	nF	where n determines the starting point in the sequence (see below) and q is the address of this code.
	50	pF	
p+1	26	qF	

The left hand order at p is used only on the first entry and is ignored by this code on subsequent entries. If the preparatory interlude is used it may be any other order.

EXIT The random number will be in  $R_1$ ,  $R_2$ , and location 6 (relative).

DISCUSSION The code uses the method of squaring a number extracting the middle 38 digits and repeating. N. Metropolis has examined the numbers of the sequence starting on the 38 digit number  $(1 \times 2^{-19}) + 3 \times 2^{-38}$  and found them random through 720,000 members of the sequence. He recommends that the first 1000 (approximately) numbers of

the sequence be discarded due to excessive zeroes. This code uses this number to produce this sequence. Please note that the numbers will have only 38 places; 0 sign digit, 38 random digits, 0 in  $2^{-39}$ .

The first time the subroutine is called in the starting word (00 1F 00 6F) will be iterated  $n+3$  times, so that the programmer can choose his starting point in the aforementioned sequence.  $n$  should exceed about 900 while it must satisfy  $n \leq 1021$ . The last six words of the routine will also be detached and can subsequently be used for storage. On subsequent entries the program parameter will have no significance and one iteration will be carried out.

The library tape is provided with an interlude separated from the subroutine by spaces which will carry out the above mentioned first entry automatically on read-in. If this routine is at  $q$ , the interlude can be followed by a directive to  $q + 7$ , placing new program into the now useless temporary positions. The interlude now is controlled by 26 orders so that the read-in will not stop. These may be changed to 24 orders as indicated, so that the program will stop during read-in. When the preparatory interlude is used, the number  $n$  must be entered in S3 before read-in as

00 F 00 nF

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CODED BY J. N. Snyder

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ns

LOCATION	ORDER	NOTES	PAGE 1	V 3
0	S5 F L4 4L	Plant link address		
1	42 11L 46 7L	Plant preparation constant		
2	00 35F 50 6L	Temporary time delay		
3	75 6L 10 21F	Square number in 6L, extract middle 38 digits and place in $R_1$ , $R_2$ , 6L.		
4	00 1F S5 1F			
5	40 6L 22 8L	Final Link		
6	00 1F 00 6F	Starting number Then storage location		
7	00 F LL F	Preparation counter		
8	00 F L5 7L	Waste Decrease counter		
9	L0 4L 46 7L			
10	36 2L L5 12L	Test for end of preparation		
11	40 1L 22 ( )F	Overwrite word 1 to remove preparation program Temporary link.		
12	42 5L 22 2L Spaces Interlude	Overwrite word		
13	50 S3 50 13L			
14	26 L 26(4) 999F			
15	00 F 26 13L 26 (4) 1N	If desired, these 26 orders may be changed to 24 orders as described in the text on page 2.		