

# Program Description I

Program Title Random Integers

Contributor's Name Larry Schneider

Address 1001 Provincial Tower 34 S. Main St.

City Wilkes-Barre

State Pa.

Zip Code 18701

**Program Description, Equations, Variables** Given a random seed between 0 and 1, this program will generate as many as 216 pseudo-random integers without repetition.

One possible algorithm is to constantly generate random integers (given M as the maximum) using the formula:

$$\text{INT} \left[ M \times \text{frac} (S + \pi)^5 \right] + 1 \quad \text{where } S \text{ is the seed and } \text{frac} (S + \pi)^5 \text{ is the new seed.}$$

and then to simply check if such a number has been used yet. If so, generate another until M random-integers (1 to M) have been generated. This program is quite fast initially but slows up considerably as more and more numbers are generated (As M increases, running time increases). The algorithm used is similar but uses the loop:  
 For I = M to 1 Random integer =  $\text{INT} \left[ I \times \text{frac} (S + \pi)^5 \right] + 1$ .

Then the integer is calculated by counting up from 1 skipping all previously used integers. Thus, the formula above need only be used M times for M integers. Thus if M = 10 and the random integer is 5, the actual number used...

(1, 4, 8 already generated) ① 2 3 ④ 5 6 ⑦ ⑧ 9 10 ... would be 7.

**Operating Limits and Warnings** Inputting a number larger than 216 for the maximum will result in an error message

Print mode is on when card is loaded.

This program has been verified only with respect to the numerical example given in *Program Description II*. User accepts and uses this program material AT HIS OWN RISK, in reliance solely upon his own inspection of the program material and without reliance upon any representation or description concerning the program material.

NEITHER HP NOR THE CONTRIBUTOR MAKES ANY EXPRESS OR IMPLIED WARRANTY OF ANY KIND WITH REGARD TO THIS PROGRAM MATERIAL, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. NEITHER HP NOR THE CONTRIBUTOR SHALL BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH OR ARISING OUT OF THE FURNISHING, USE OR PERFORMANCE OF THIS PROGRAM MATERIAL.

# Program Description II

~~Sketch(es)~~ Each memory register is a 9 digit number with one decimal:

Memory Register 0: 00000000.9 The 0's from Right to Left represent the digits  $(9 \times R + 1)$  to  $(9 \times R + 9)$  where  $R$  is the memory register. In this case (for  $R_0$ ), the numbers represented are 1 to 9 (For Register 23 ( $R_0$ ), the numbers are 208 to 216). The 9 above means that 9 of the digits are as yet unused. Thus, if the numbers 1, 4, and 8 had already been generated, the register would look like: 010001001.6

Sample Problem(s) ① Input the seed .123456789 (STO E)

Generate the random integers using 12 as the maximum.

② Do the same using the seed .987654321 (STO E)

Solution(s) Input 12 A

① 1 7 12 8 4 11 9 10 2 3 6 5

② 6 7 9 5 12 1 2 8 3 11 4 10

Reference(s)

STORE SEED, input max., hit START.



f PRINT?

START

SEED

[illegible]



| STEP | KEY ENTRY | KEY CODE | COMMENTS                                    |
|------|-----------|----------|---------------------------------------------|
| 113  | STD + (i) | 33 61 24 | Replace 0 with 1 at # position.             |
| 114  | h R↓      | 35 53    |                                             |
| 115  | +         | 61       | Random integer used                         |
| 116  | h F? O    | 35 71 00 | Print on?                                   |
| 117  | f -x-     | 31 84    | Yes                                         |
| 118  | h Pause   | 35 72    | No                                          |
| 119  | .         | 83       |                                             |
| 120  | i         | 01       |                                             |
| 121  | STD -(i)  | 33 51 24 | Increase decimal (# of unrel<br>#/'s) by 1. |
| 122  | 2         | 02       |                                             |
| 123  | 4         | 04       |                                             |
| 124  | h STI     | 35 33    | Decrement counter                           |
| 125  | g DSZ     | 32 33    | and skip on 0.                              |
| 126  | GTO I     | 22 01    | C ≠ 0 - new #                               |
| 127  | CLX       | 44       | C = 0 - end                                 |
| 128  | h RTN     | 35 22    |                                             |
| 129  | g LBL A   | 32 25 11 | Print? Mode switch                          |
| 130  | h F? O    | 35 71 00 | Print? mode on?                             |
| 131  | GTO S     | 22 05    | Yes ...                                     |
| 132  | h SF O    | 35 51 00 | No - turn on                                |
| 133  | I         | 01       |                                             |
| 134  | h RTN     | 35 22    |                                             |
| 135  | f LBL S   | 31 25 05 | yes ...                                     |
| 136  | h CF O    | 35 61 00 | Print? mode turned off.                     |
| 137  | O         | 00       |                                             |
| 138  | h RTN     | 35 22    |                                             |
| 140  |           |          |                                             |
| 150  |           |          |                                             |
| 160  |           |          |                                             |
| 170  |           |          |                                             |
| 180  |           |          |                                             |
| 190  |           |          |                                             |
| 200  |           |          |                                             |
| 210  |           |          |                                             |
| 220  |           |          |                                             |

LABELS                  FLAGS                  SET STATUS

| B     | C        | D   | E   | F   | ON OFF                                                         | TRIG                                    | DISP                                    |
|-------|----------|-----|-----|-----|----------------------------------------------------------------|-----------------------------------------|-----------------------------------------|
| START | a PRINT? | b   | c   | d   | e                                                              | DEG <input checked="" type="checkbox"/> | FIX <input checked="" type="checkbox"/> |
| 0 ✓   | 1 ✓      | 2 / | 3 ✓ | 4 ✓ | 1 <input type="checkbox"/> <input checked="" type="checkbox"/> | GRAD <input type="checkbox"/>           | SCI <input type="checkbox"/>            |
| 5 ✓   | 6        | 7   | 8   | 9   | 2 <input type="checkbox"/> <input type="checkbox"/>            | RAD <input type="checkbox"/>            | ENG <input type="checkbox"/>            |
|       |          |     |     |     | 3 <input type="checkbox"/> <input type="checkbox"/>            | n <u>  0  </u>                          |                                         |