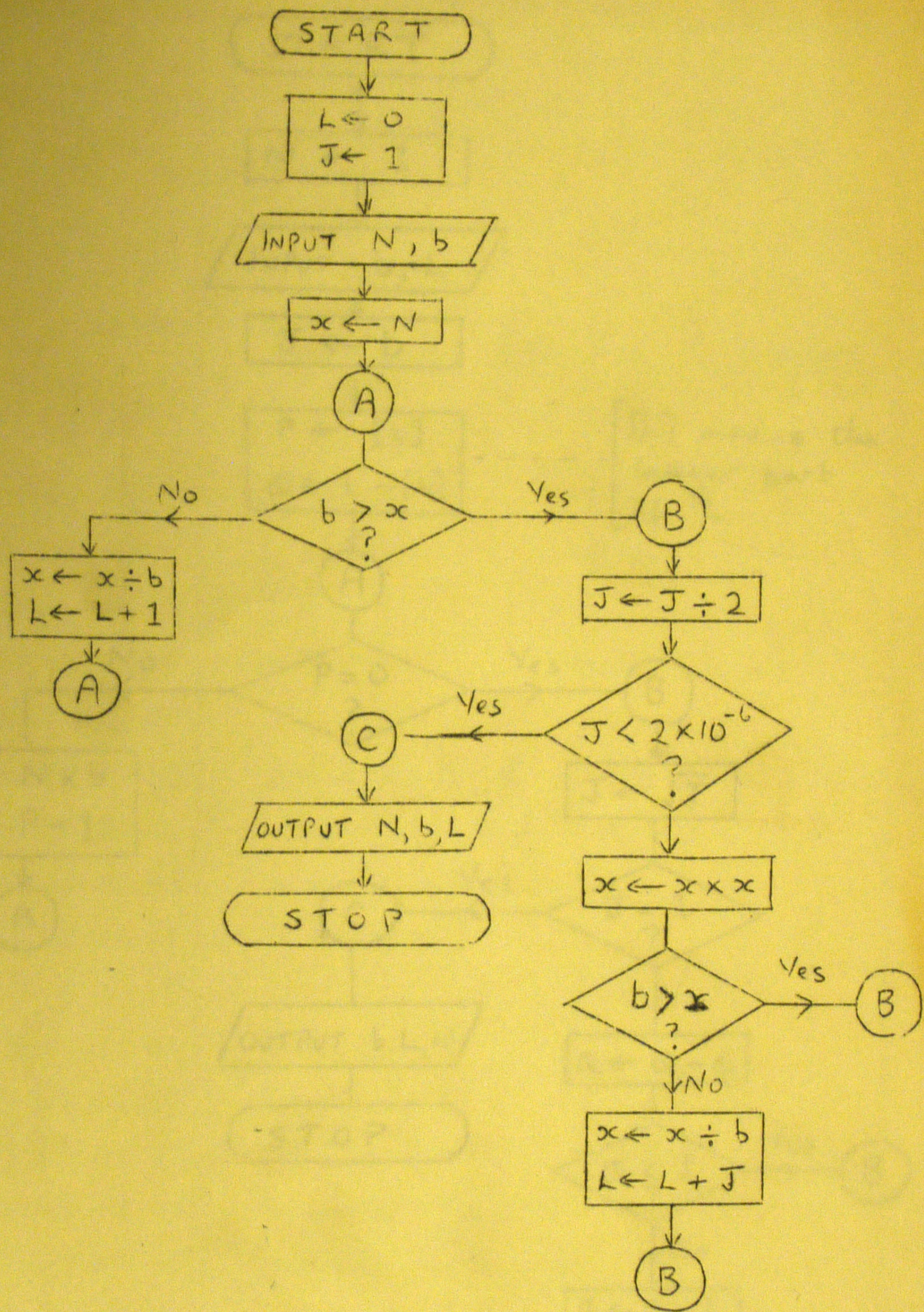
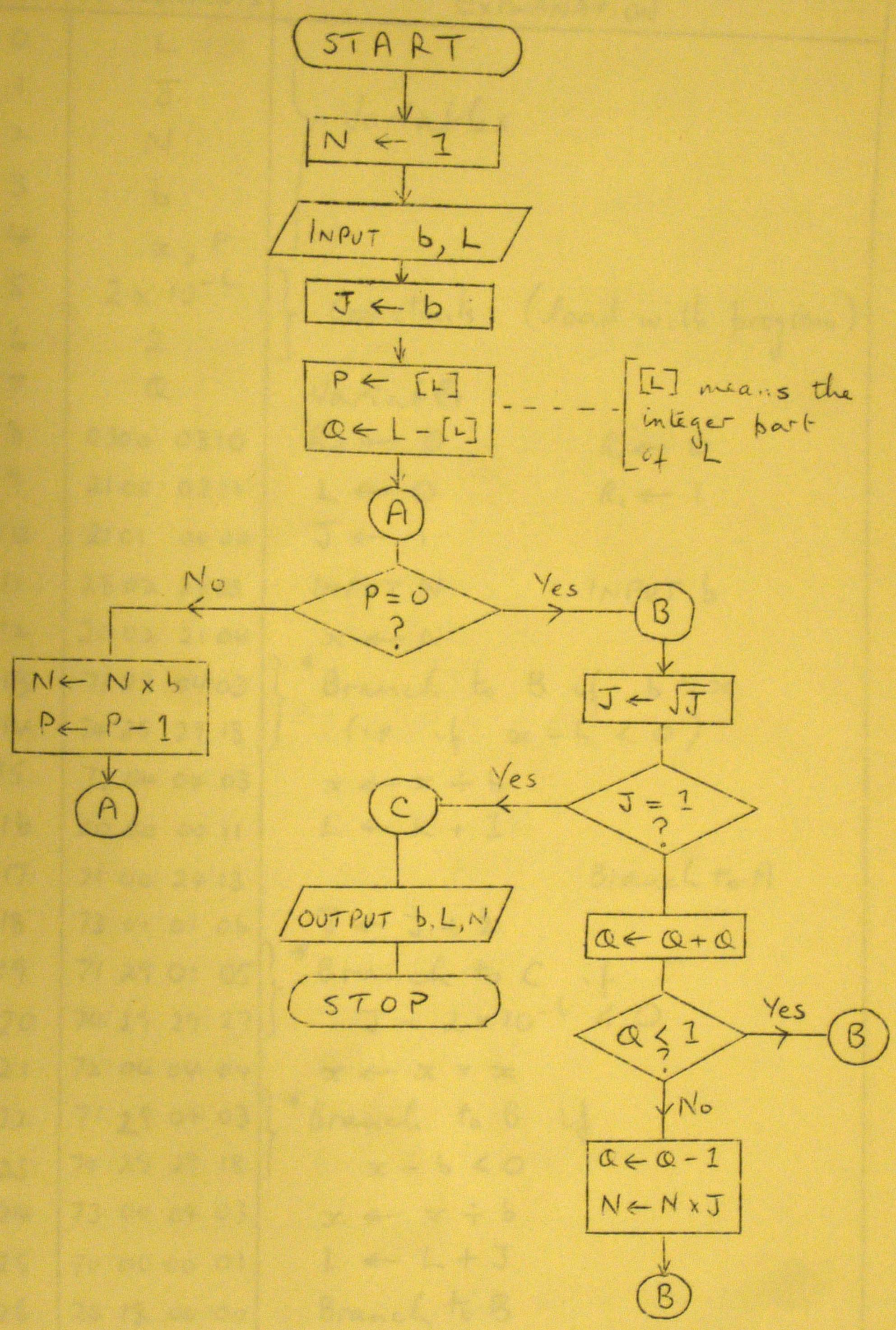


PROGRAMS FOR  $\log_b N$  AND  $b^L$

Flow Diagram for  $L \leftarrow \log_b N$



# Flow Diagram for $N \leftarrow b^L$



Program for  $L \leftarrow \log_b N$

ADDRESS	CONTENTS	EXPLANATION
0	L	Variables
1	J	
2	N	
3	b	
4	x, P	
5	$2 \times 10^{-6}$	Constants (load with program)
6	2	
7	Q	Variable
START → 8	0300 0310	$R_0 \leftarrow 0$ $R_1 \leftarrow 0$
9	2100 0311	$L \leftarrow 0$ $R_1 \leftarrow 1$
10	2101 0000	$J \leftarrow 1$
11	2802 2803	INPUT N      INPUT b
12	2002 2104	$x \leftarrow N$
(A) 13	7129 0403	* Branch to B if $b > x$ (i.e. if $x - b < 0$ )
14	7429 2918	
15	7304 0403	$x \leftarrow x \div b$
16	2000 0011	$L \leftarrow L + 1$
17	2100 2413	Branch to A
(B) 18	7301 0106	$J \leftarrow J \div 2$
19	7129 0105	* Branch to C if $J - 2 \times 10^{-6} < 0$
20	7429 2927	
21	7204 0404	$x \leftarrow x \times x$
22	7129 0403	* Branch to B if $x - b < 0$
23	7429 2918	
24	7304 0403	$x \leftarrow x \div b$
25	7000 0001	$L \leftarrow L + J$
26	2418 0000	Branch to B
(C) 27	7902 0300	Display N, b, L
28	2808 0000	Branch to START
29	Working	

\* Branches employ the square root subroutine.

Program for  $N \leftarrow b^L$

	ADDRESS	CONTENTS	EXPLANATION
START →	30	1	Constant (load with program)
	31	73 02 30 30	$N \leftarrow 1$
	32	28 03 28 00	INPUT b                      INPUT L
	33	20 03 21 01	$J \leftarrow b$
	34	20 00 17 10	$(R_0 R_1) \leftarrow L$ Right shift $R_1$ by $(R_0)$
	35	03 00 21 04	$R_0 \leftarrow 0$ $P \leftarrow [L]$
	36	71 07 00 04	$Q \leftarrow L - P$
(A)	37	20 04 05 10	* Branch to B if $P = 0$
	38	25 42 00 00	
	39	01 11 21 04	$P \leftarrow P - 1$
	40	72 02 02 03	$N \leftarrow N \times b$
	41	24 37 00 00	Branch to A
(B)	42	74 01 01 30	$J \leftarrow \sqrt{J}$
	43	20 01 01 11	* Branch to C if $J = 1$
	44	05 10 25 51	
	45	70 07 07 07	$Q \leftarrow Q + Q$
	46	71 29 07 30	} Branch to B if $Q - 1 < 0$
	47	74 29 29 42	
	48	71 07 07 30	$Q \leftarrow Q - 1$
	49	72 02 02 01	$N \leftarrow N \times J$
	50	24 42 00 00	Branch to B
(C)	51	79 03 00 02	DISPLAY b, L, N
	52	24 31 00 00	Branch to START

\* These branches use register tests on the contents of  $R_0$  and  $R_1$

Both of the above programs use the square root subroutine

74 cd ef gh  
 ⇒ "if  $(ef) \geq 0$  then  $(cd) \leftarrow \sqrt{(ef)}$  else goto gh"