



51657 Program Description I

Program Title 50 STEPS PROGRAMMABLE HP MACHINE FOR COMPLEX
CALCULUS

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Program Description, Equations, Variables			You can do complex programs so easy than real ones on your HP 67. Every program step is coded with upto 3 ^{digits} and the result of them stored in registers A to E on following size: X.XXXXXXXX			
	Re(z)	Im(z)	A big advantage: every memory (n: 0 to 9) is addressable.			
	Prim	Sec.				
R ₀	LtX	LtX	} addressable stack			
R ₁	X	X				
R ₂	Y	Y				
R ₃	Z	Z				
R ₄	T	T				
R ₅	Mem 5	Mem 5	Function	Code	Function	Code
R ₆	Mem 6	Mem 6	+	1	RCL n	9 n
R ₇	Mem 7	Mem 7	x	2	DSZ	0 n p ≤ 047
R ₈	Mem 8	Mem 8	CHS	3	GTOn p	(Stops if R ₅ 50)
R ₉	I	Program Counter	x=y	4	x ≤ y	0(n+5)p ≥ 050
	↑ number of loops		n to $\sqrt[n]{x}$	5 n		
			n to x^n	6 n	↑ = RCL 1	
R _A	Step 00 to 09		$1/\sqrt{x}$	50	LtX = RCL 0	
R _B	Step 10 to 19		$1/x$	60	R↑ = RCL 4	
R _C	Step 20 to 29		MT0 STO n	7 m		
R _D	Step 30 to 39		STO + m	70 m		
R _E	Step 40 to 49		STO x m	8 m		

Operating Limits and Warnings The Program Counter value is 20,0 to 24,9 and must have only one decimal

The argument n for $\sqrt[n]{x}$ and x^n must be integer: 1, 2, 3, 4, 5, 6, 7, 8, 9

because the code has only 2 ~~plus~~ digits

$x = |x| e^{i\theta} \Rightarrow \sqrt[n]{x} = \sqrt[n]{|x|} e^{i\frac{\theta}{n}}$

I = R₅ has to be strict positive if you want the program to stop

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.

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Program Listing I

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STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
001	LBL 7	31 25 07			STO 1	33 01	
	P=S	31 42			RCL 3	34 03	
	LBL 2	32 25 15	Start		STO 2	33 02	
	CFO	35 61 00		060	RCL 4	34 04	
	Gsub 1	31 22 01			STO 3	33 03	
	Pause	35 72			P=S	31 42	
	g	09			F? 2	35 71 02	
	+	61			GTO 0	22 00	
	STI	35 33			GTO 2	22 31 15	
010	GTO(i)	22 24			LBL PC	32 25 13	(STOxm)
	LBL 1	31 25 01			Gsub 1	31 22 01	
	SF 2	35 51 02			STI	35 33	
	P=S	31 42			RCL(i)	34 24	
	RCL 3	34 09		070	P=S	31 42	
	STI	35 33			RCL(i)	34 24	
	CLX	44			Gsub 2	31 22 02	
	RCL(i)	34 24			STO(i)	33 02	
	RCL	35 34			P=S	31 42	
	FRAC	32 83			X=Y	35 52	
020	.	83			STO(i)	33 24	
	1	01			GTO 7	22 07	
	STO+g	33 61 09			LBL 2	31 25 02	Calculation of x
	÷	81			X=Y	35 52	
	1	01		080	→P	32 72	
	-	51			X=Y	35 52	
	10 ^x	32 53			RCL 1	34 01	
	x	71			P=S	31 42	
	FRAC	32 83			RCL 1	34 01	
	1	01			→P	32 72	
	0	00			R↑	35 54	
	x	71			x	71	
	INT	31 83			X=Y	35 52	
	P=S	31 42			R↑	35 54	
	RTN	35 22		090	+	61	
	LBL A	31 25 11	(+)		X=Y	35 52	
	RCL 1	34 01			→R	31 72	
	STO+2	33 61 02			RTN	35 22	
	P=S	31 42			LBL E	31 25 15	(√x or 1/x)
	F? 2	35 71 02			SFO	35 51 00	
040	GTO A	22 11			LBL a	32 25 11	(x ⁿ or 1/x)
	SF 2	35 51 02			1	01	
	GTO 0	22 00			CHS	42	
	LBL B	31 25 12	(x)		Gsub 1	31 22 01	
	RCL 2	34 02		100	x=0	31 51	
	RTN P=S	31 42			X=Y	35 52	
	RCL 2	34 02			F? 0	35 71 00	
	Gsub 2	31 22 02			1/x	35 62	
	STO 2	33 02			↑	41	
	P=S	31 42			P=S	31 42	
050	X=Y	35 52			RCL 1	34 01	
	STO 2	33 02			STO 0	33 00	
	P=S	31 42			P=S	31 42	
	LBL C	31 25 00	(↓ and Store Ltr X)		RCL 1	34 01	
	RCL 1	34 01		110	STO 0	33 00	
	STO 0	33 00			→P	32 72	
	RCL 2	34 02			R↑	35 54	

REGISTERS

0	Ltr X	1	X	2	Y	3	Z	4	T	5	Mem 5	6	Mem 6	7	Mem 7	8	Mem 8	9	I
S0	Ltr X	S1	X	S2	Y	S3	Z	S4	T	S5	Mem 5	S6	Mem 6	S7	Mem 7	S8	Mem 8	S9	Pgm Counter
A	Control PGM	B	Control PGM	C	Control PGM	D	Control PGM	E	Control PGM	I	USED								

STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
	γ^2	35 63			LBL C	31 25 13	(CHS)
	$\pi \gamma$	35 52		170	γ	01	
	R $\uparrow$	35 54			CHS	42	
	x	71			STO $\rightarrow$ 1	33 71 01	
	$\pi \gamma$	35 52			P $\rightarrow$ S	31 42	
	R $\downarrow$	31 72			STO $\times$ 1	33 71 01	
	STO 1	33 01			GTO 7	22 07	
120	P $\rightarrow$ S	31 42			LBL 9	31 25 09	
	$\pi \gamma$	35 52			4	04	
	STO 1	33 01			G $\rightarrow$ B 1	31 22 01	
	GTO 7	22 07			$\pi \gamma$	32 71	
	LBL 6	32 25 12	(STO (+) n)	180	GTO 5	22 05	
	G $\rightarrow$ B 1	31 22 01			SF 0	35 51 00	
	ST I	35 33			5	05	
	$\pi \neq 0$	31 81			-	51	
	GTO 3	22 03			LBL 5	31 25 05	
	SF 0	35 51 00			G $\rightarrow$ B 1	31 22 01	
130	G $\rightarrow$ B 1	31 22 01			1	01	
	ST I	35 33			0	00	
	LBL 3	31 25 03			$\div$	81	
	RCL (i)	34 24			+	61	
	RCL 1	34 01		190	2	02	
	F? 0	35 71 00			0	00	
	+	61			+	61	
	STO (i)	33 24			P $\rightarrow$ S	31 42	
	P $\rightarrow$ S	31 42			F? 0	35 71 00	
	F? 2	35 71 02			GTO 6	22 06	
140	GTO 3	22 03			STO 9	33 09	
	GTO e	22 31 15			P $\rightarrow$ S	31 42	
	LBL d	32 25 14	(RCL n)		1	01	
	G $\rightarrow$ B 1	31 22 01			STO - 9	33 51 09	
	ST I	35 33		200	RCL 9	34 09	
	LBL 4	31 25 04			$\pi \gamma$	31 81	
	RCL (i)	34 24			GTO e	22 31 15	
	RCL 3	34 03			R/S	84	STOP
	STO 4	33 04			LBL 6	31 25 06	
	RCL 2	34 02			ST I	35 33	
150	STO 3	33 03			RCL 2	34 02	
	RCL 1	34 01			P $\rightarrow$ S	31 42	
	STO 2	33 02			RCL 2	34 02	
	R $\downarrow$	35 54			$\rightarrow$ P	32 72	
	STO 1	33 01		210	RCL 1	34 01	
	P $\rightarrow$ S	31 42			P $\rightarrow$ S	31 42	
	F? 2	35 71 02			RCL 1	34 01	
	GTO 4	22 04			$\pi \gamma$	35 52	
	GTO e	22 31 15			$\rightarrow$ P	31 72	
	LBL D	31 25 14	($\pi \gamma$)		$\pi \gamma$	35 52	
160	RCL 1	34 01			R $\downarrow$	35 53	
	RCL 2	34 02			$\pi \gamma$	32 81	
	STO 1	33 01			GTO 7	22 07	
	$\pi \gamma$	35 52			RCL I	35 34	
	STO 2	33 02		220	STO 9	33 09	
	P $\rightarrow$ S	31 42			GTO 7	22 07	
	F? 2	35 71 02					
	GTO D	22 14					
	GTO e	22 31 15					

LABELS					FLAGS	SET STATUS		
γ^2	x	CHS	$\pi \gamma$	$\sqrt{x}$ or $1/\sqrt{x}$	USED	FLAGS	TRIG	DISP
γ^2 or $1/\gamma^2$	STO (+) n	STO $\times$ n	RCL n	START	1	ON OFF	DEG ☐	FIX ☒
Used	Used	Used	Used	Used	2	0 ☐ π	GRAD ☒	SCI ☐
Used	Used	Used	Used	Used	3	1 ☐ γ	RAD ☐	ENG ☐
						2 ☐ γ		n <u>9</u>
						3 ☐ π		