

STEP KEY ENTRY 1 KEY CODE

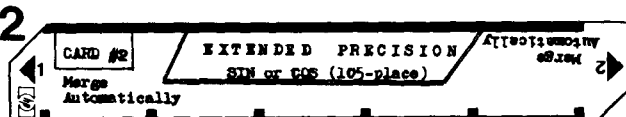
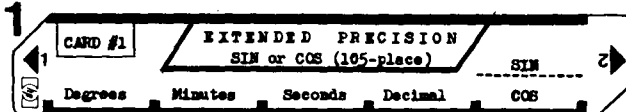
1	LBL fb	32 25 12
	CLX	AA
	STO D	33 14
	STO 0	33 00
5	1	01
	2	02
	ST I	35 33
	-	83
	5	05
10	-	51
	X-I	35 24
	SFZ	35 51 02
	CF 1	35 61 01
	LBL 1	31 25 01
15	OSR 2	31 22 02
	X-Y	35 52
	X-I	35 24
	X-Y	35 52
	OSR 2	31 22 02
20	X	71
	OTO A	22 04
	LBL 2	31 25 02
	RCL (1)	34 24
	RC I	35 34
25	FRAC.	32 83
	X>0	31 81
	OTO 3	22 03
	CLX	AA
	+	61
30	INT.	31 83
	P+1	35 71 01
	STO (-)(1)	33 51 24
	XXX	43
	5	05
35	+	81
	RTN	35 22
	LBL 3	31 25 03
	CLX	AA
	+	61
40	FRAC.	32 83
	P+1	35 71 01
	STO (-)(1)	33 51 24
	RTN	35 22
	LBL 4	31 25 04
45	X-Y	35 52
	RC I	35 34
	+	61
	X-I	35 24
	X-Y	35 52
50	OSR 7	31 22 07
	ISZ	32 34
	-	83
	5	05
55	+	61
	X-I	35 24
	RC I	35 34
	-	51
	X-I	35 24
60	DSZ	31 33
	OTO 1	22 01
	ST I	35 33
	XXX	43
	5	05
65	STO (X) 0	33 71 00
	X-Y	35 52
	FRAC.	32 83
	X>0	31 81
	OTO 3	22 03
70	R4	35 53
	STO (X)(1)	33 71 24
	RCL (1)	34 24
	FRAC.	32 83
	ISZ	31 34
75	P+2	35 71 02
	OTO 9	22 09
	OSR 7	31 22 07
	R4	35 53
	STO (X)(1)	33 71 24
80	RTI	35 54
	LBL 9	31 25 09
	R4	35 53
	DSZ	31 33
	RCL (1)	34 24
85	INT.	31 83
	OTO A	22 04
	LBL 7	31 25 07
	RCL (1)	34 24
	1	01
90	STO (+) 0	33 61 00
	-	51
	+	61
	X<0	31 71
	XXX	43
95	0	00
	STO (-) 0	33 51 00
	+	61
	STO (1)	33 24
	RTN	35 22
100	LBL 3	31 25 03

STEP KEY ENTRY 2 KEY CODE

101	CLX	AA
	LBL 4	31 25 04
	RCL 0	34 00
	STO (-) 0	33 51 00
105	+	61
	STO (1)	33 24
	R4	35 53
	STO (+)(1)	33 61 24
	STO (+)(1)	33 61 24
110	ISZ	31 34
	X-I	35 24
	1	01
	2	02
	-	51
115	X-I	35 24
	LST X	35 82
	DSZ	31 33
	OTO 1	22 01
	R4	35 53
120	P-S	31 42
	STO (X) 3	33 71 03
	P-S	31 42
	RTN	35 22
	LBL 0	31 25 00
125	MERGE	32 41
	PAUSE	35 72
	R/S	84
	LBL B	31 25 12
	+	61
130	LBL A	31 25 11
	6	06
	0	00
	X	71
	RTN	35 22
135	LBL C	31 25 13
	P-S	31 42
	+	61
	XXX	43
	+	04
140	X	71
	LBL D	31 25 14
	ISZ	31 34
	XXX	43
	5	05
145	+	81
	STO (1)	33 24
	CLX	AA
	RTN	35 22
149	LBL fe	32 25 15
150	RCL (1)	34 24
	+	61
	CMS	42
	XXX	43
	5	05
155	+	61
	STO (1)	33 24
	XXX	43
	5	05
	CMS	42
160	ISZ	31 33
	OTO fe	22 31 15
	6	06
	7	07
	6	06
165	0	00
	0	00
	STO (-) 1	33 51 01
	LBL E	31 25 15
	RCL 1	34 01
170	3	03
	2	02
	5	05
	+	81
	X	31 54
175	INT.	31 83
	1	01
	1	01
	+	61
	2	02
180	X	71
	STO B	33 15
	OSR fb	32 22 12
	2	02
	3	03
185	ST I	35 33
	1	01
	1	01
	OSB fe	32 22 13
	1	01
190	1	01
	ST I	35 33
	2	02
	2	02
	OSB fe	32 22 13
195	OSB fb	32 22 12
	2	02
	3	03
	ST I	35 33
	1	01
200	1	01

1. SIN or COS (105-place accuracy) BY: Ron Knapp 618

2. SEE TEXT AND CARD 2 PROGRAM ON PAGE 27



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1.	Enter Card #1 (both sides)			
2.	Enter DATA Card (one side)			
3.	Key in number of Degrees		A	converts to Minutes
4.	Key in number of Minutes		B	Adds & converts to Seconds
5.	Key in number of Seconds (whole number plus any decimal up to 4 places. (Use decimal point))		C	0.00000
6.	Key in any additional digits in decimal. If none, skip this item and go to 8. If less than 10, Add trailing zeroes. Do not use decimal point.		D	0.00000
7.	Repeat 6 until all decimals are entered			
8.	(a) For COS of the angle		E	
	(b) For SIN of the angle		fe	
9.	Insert Card #2, side 1 for automatic merging. This will take place about 30 minutes from start.			
10.	After Side 1 has merged, insert Side 2 for automatic merging. This can be done at any time within 4 or 5 hours. Machine will wait if you forget.			
11.	Machine will stop displaying first 5 digits of answer. Press R/S for 5 more.			

Read-out can be repeated by storing 13 in the I-Reg. and pressing E.	
The answer is displayed in decimal form, therefore no leading zeroes are lost.	
The "Display 5" format guards against the loss of any trailing zeroes.	
The 110-place constant stored by the DATA Card represents "pi" divided by 180, divided by 3600, divided by 64. Since the Angle input is automatically converted to seconds, this constant, multiplied by the input, results in the radian measure of 1/64 the angle desired. The COS of this very small angle is then computed by using only 10 to 20 terms of the series. After that, the doubling principle is used 6 times to obtain the original angle desired. 43 terms of the series would have been required if the doubling principle had not been used. Almost 200 minutes of run-time were saved, at a loss of 4 decimal places in accuracy. The machine will read out all 110 places but do not trust any past the 106th.	
Total run-time is 7 hours--just right for running while you sleep.	

STEP KEY ENTRY KEY CODE

201	OSR fe	32 22 13
	OTO 0	22 00
	LBL fe	32 25 13
	RCL (1)	34 24
205	X-Y	35 52
	X-I	35 24
	X-Y	35 52
	STO (1)	33 24
	X-Y	35 52
	DSZ	31 33
210	X=0	31 51
	RTN	35 22
	X-I	35 24
	DSZ	31 33
215	OTO fe	22 31 13
	RTN	35 22
220		
224		

Registers

0	1	2	3	4	5	6	7	8	9
5 42937	6 80209	7 46118	8 92403	9 48778					
12431	49573	09773	52000	84582					

0	1	2	3	4
5	6	7	8	9

A 65487	B 45983	C 21020	D	E	F
08401	11407	16027			

Labels

A	B	C	D	E
Degrees	Minutes	Seconds	Decimal	COS
a	Multiply	Storage Shift	d	e
0	1	2	3	4
5	Merge	Used	Used	Used
6	6	7	8	9

Flag Set Status Unnecessary

0	1	2	3
---	---	---	---

Fixed Notation, Disp. 5.

STEP KEY ENTRY KEY CODE

1	F+1	35 71 01
	R/S	84
	LBL fa	32 25 11
	1	01
5	3	03
	ST I	35 33
	RCL E	34 15
	RCL E	34 15
	1	01
10	-	51
	X	71
	EXX	43
	5	05
	+	81
15	ENTER↑	41
	ENTER↑	41
	ENTER↑	41
	RCL E	34 15
	+	41
20	STO E	33 15
	SP1	35 51 01
	CLX	44
	LBL 5	31 25 05
	OSB 2	31 22 02
25	+	41
	ENTER↑	41
	R↑	35 54
	+	81
	INT.	31 83
30	STO 0	33 00
	1	01
	+	41
	OSB	42
	EXX	43
35	5	05
	+	41
	RC I	35 34
	FRAC.	32 83
	X>0	31 81
40	SP2	35 51 02
	CLX	44
	+	41
	DSZ	31 33
	F+2	35 71 02
45	OTO 3	22 03
	STO (+)(1)	33 61 24
	OTO 4	22 04
	LBL 3	31 25 03
49	EXX	43
50	5	05
	+	81
	STO (+)(1)	33 61 24
	LBL A	31 25 04
	CLX	44
55	RCL 0	34 00
	DSZ	31 34
	X-I	35 24
	+	83
	5	05
60	+	41
	X-I	35 24
	R↑	35 54
	X	71
	-	51
65	EXX	43
	5	05
	X	71
	2	02
	A	04
70	RC I	35 34
	-	51
	X=0	31 61
	SP2	35 51 02
	R↑	35 53
75	F+2	35 71 02
	OTO 5	22 05
	RCL E	34 15
	INT.	31 83
	2	02
80	-	51
	STO E	33 15
	X=0	31 51
	OTO 3	22 03
	OSB fa	32 22 12
85	OTO fa	22 31 11
	LBL 3	31 25 03
	6	06
	STO E	33 15
	2	02
90	2	02
	ST I	35 33
	1	01
	1	01
	OTO 0	22 00
95		
100		

STEP KEY ENTRY KEY CODE

1	LBL 5	31 25 05
	OSB fe	32 22 13
	OSB fb	32 22 12
	5	05
5	EXX	43
	A	04
	P-S	31 42
	STO (-)3	33 51 03
	P-S	31 42
10	2	02
	3	03
	.	83
	5	05
	ST I	35 33
15	CLX	44
	SP1	35 51 01
	LBL 8	31 25 08
	OSB 2	31 22 02
20	2	02
	X	71
	+	41
	INT.	31 83
	LST X	35 82
	FRAC.	32 83
25	RC I	35 34
	FRAC.	32 83
	X=0	31 51
	OTO 3	22 03
	R↑	35 53
30	OTO 4	22 04
	LBL 3	31 25 03
	R↑	35 53
	EXX	43
	5	05
35	X	71
	LBL 4	31 25 04
	STO (+)(1)	33 61 24
	R↑	35 53
	RC I	35 34
40	1	01
	3	03
	X=Y	32 51
	OTO 3	22 03
	R↑	35 53
45	+	83
	5	05
	-	51
	ST I	35 33
49	R↑	35 53
50	EXX	43
	5	05
	+	81
	OTO 8	22 08
	LBL 3	31 25 03
55	RCL E	34 15
	1	01
	-	51
	STO E	33 15
	X=0	31 51
60	OTO E	22 15
	2	02
	3	03
	ST I	35 33
	1	01
65	1	01
	OSB fe	32 22 13
	1	01
	1	01
	ST I	35 33
70	2	02
	2	02
	OTO 5	22 05
	LBL fe	32 25 13
	RCL (1)	34 24
75	X-Y	35 52
	X-I	35 24
	X-Y	35 52
	STO (1)	33 24
	X-Y	35 52
80	DSZ	31 33
	X=0	31 51
	RTN	35 22
	X-I	35 24
	DSZ	31 33
85	OTO fe	22 31 13
	RTN	35 22
	LBL E	31 25 15
	CF1	35 61 01
	OSB 2	31 22 02
90	R/S	84
	RC I	35 34
	.	83
	5	05
	+	41
95	ST I	35 33
	OTO E	22 15
100		

EXTENDED PRECISION

SIN OR COS (105-PLACE)

SEE INSTRUCTIONS AND CARD 1 PROGRAM ON PAGE 26

65 NOTES, V3R10P31, gave a very good table of values for SIN X and COS X, carried out to 30 places. With this program I have revised it to a 105-place table. Since I do not have any printed tables available by which I can check my results, it was necessary to devise a means of checking the accuracy of my program.

Of course $\sin 30^\circ$ equals .5, the square of $\sin 45^\circ$ equals .5, and the square of $\sin 60^\circ$ equals .75. When the program gave these results to 105 places, I was reasonably sure it was working O.K. However, to be sure, I squared every result obtained for my table of SIN or COS (105-place) and made another table of SQUARES OF SIN AND COS (105-place). I placed $\sin^2$ and $\cos^2$ side by side for each angle calculated. It is obvious from this table that $\sin^2 X$ plus $\cos^2 X$ equals 1.0000000... (to 105 places)...000000.

I expect someone to say "Why didn't you program it to work TAN also. Just remember that TAN equals SIN/COS. So all you need to do is write your own program to divide a 105-place number by another 105-place number, and there you have it.

Ron Knapp (618)

EXTENDED PRECISION SQUARES

(UP TO 230D SQUARED EQUALS 460D)

There are an abundance of programs for extended precision squares. One program is for 20D squared to 40D, another for 40D squared to 80D, and another for 70D squared to 140D. Then there is a program for 100D squared to 100D. Why then, do I submit yet another program for squares?

The answer is simple. Versatility! This program will calculate the square of any number up to 230D. The run-time is in proportion to the size of the input. In addition, you have the choice of the exact square carried out completely, or the square of an approximation, carried out to the same number of digits as the input. Best of all, the run-time compares very favorably with any of the other programs which are made for just one size input. For example, the table below gives approximate times for various size of input:

Size Input	Exact Square	Approx. Square
10D	20 Sec.	20 Sec.
20D	1 Min.	40 Sec.
30D	2 Min.	1 Min.
40D	3 "	2 "
50D	4 "	3 "
60D	6 "	4 "
70D	8 "	5 "
80D	10 "	6 "
90D	13 "	7 1/2 "
100D	16 "	9 "
110D	19 "	10 1/2 "
120D	22 "	12 "
130D	26 "	14 "
140D	30 "	16 "
150D	34 "	18 "
160D	38 "	20 "
170D	43 "	23 "
180D	48 "	26 "
190D	53 "	29 "
200D	59 "	32 "
210D	65 "	35 "
220D	71 "	38 "
230D	78 "	41 "

Submitted by Ron Knapp, 618

R/S

SEE PROGRAM ON PAGE 24

CONTEST?

I'd like to propose a contest that's a little different from your normal run of the mill contest; Write an "INTERVIEW" with the 67 (or 97) that has you asking it questions and it answering with nnns. To simplify things and get more people involved, there will be no need to actually write the program or the nnns but they must be the standard nnns that the 67(97) can do in the display. This leaves out: m,n,v,x,f,h,j,k,p,u,w,q and maybe more. The object of the interview will be humour. You, the interviewer, will ask some strange questions and make some funny comments (in your opinion) and get some GOOD answers. Example:

"I understand that you forgot what to say at your wedding, is that true?" 67 answers YES.
 "So the best man prompted you with what?" 67-SAY.I do
 "And you did?" 67- YES.I did
 "What was your wife's name again?" 67- Sr.52
 "I can see why that didn't last."
 "What did she say to you that made you propose?" 67-I,d BE BOSS

That's the general idea. It could be a lot of fun for you and the rest of us that end up reading whatever you come up with. Maybe Richard can provide a PRIZE??? a booby prize? zip? [1926]

R/S