

Program Title ELECTRONIC PING PONG

Contributor's Name LARRY SCHNEIDER

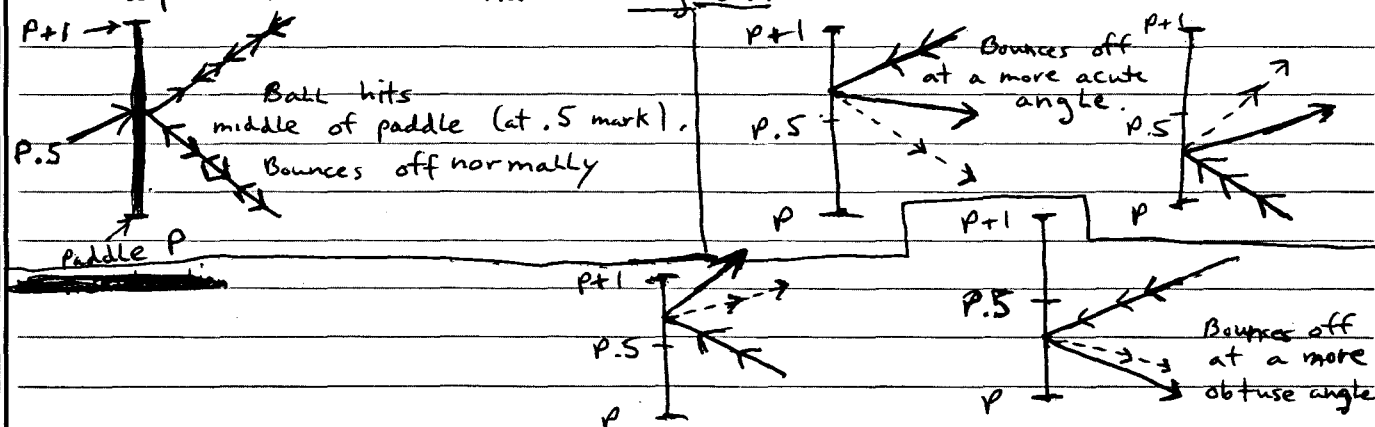
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City WILKES-BARRE

State PA.

Zip Code 18701

**Program Description, Equations, Variables** This game is played on a grid marked off vertically in logarithmic units. The minimum value on the y axis is 1 and the maximum value is 6. The sample game board on <sup>PAGE 4</sup> ~~the following page~~ should be self explanatory. Note that a single unit on the x axis (-2 to -1 or 0 to 1) must be the same length as <sup>the</sup> line from 1 to 2 on the y axis. Each player has 5 paddles numbered 1 to 5 as shown at either end of the game board. The ball in motion will bounce off the top and bottom walls ( $y = 6$ ,  $y = 1$ ) normally but will bounce off a paddle with a "natural english." This is shown below:



#### Summary of Ball Bouncings

vertical direction of ball	relationship to .5 mark	Angle off the paddle
up/down	at .5	normal / normal
up/down	Below .5	more acute / more obtuse
up/down	above .5	more obtuse / more acute

**HOWEVER, THIS INFORMATION IS NOT REQUIRED TO PLAY THE GAME!**

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 Description I

Program Title PING PONG

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Address \_\_\_\_\_

City \_\_\_\_\_

State \_\_\_\_\_

Zip Code \_\_\_\_\_

**Program Description, Equations, Variables** The position of the ball is given only at the points  $x = -3, -2, -1, 0, 1, 2, 3$ . Output is like so:

$\pm Y.YY \pm XX$  where  $\pm Y.YY$  is the y coordinate and the exponent  $\pm XX$  is the X coordinate. To see the ball bounce around by itself, do the following after reading in the program: Key in .123456789 STO C. Initialize the AUTO mode by hitting fc. (A "1" should now be displayed). The ball will start at  $x = -3$  and, say,  $y = 3$ . The coordinates output after keying 3 A are: -3, 3; -2, 2.39; -1, 1.91; 0, 1.52; 1, 1.22; 2, 1.03; 3, 1.29 (after bouncing off bottom wall); 2, 1.51 and so on. Continue doing this and following the ball's path until you're familiar with the lay out of the board. Playing the game is easy. Initialize by hitting fc. Player 1 serves by using the A key, player 2 uses the E key. Before serving, player must input A paddle number which corresponds to the y coordinate where the ball begins ( $y = 1, 2, 3, 4, 5$ ). The ball's position is given at 5 points. At the 5<sup>th</sup> point ( $x = \pm 1$ ), the coordinates blink 4 times. During this time, the player receiving must input a paddle number; i.e. the one he thinks the ball will eventually hit. The ball continues moving. If the paddle number

~~Operating Limits and Warnings~~ chosen was incorrect the new score will flash. If correct, the game continues until one player misses. The player winning a point serves on the next volley. Note there are various ways to increase the game's difficulty: Decrease the number of blinks when  $x = \pm 1$  (change step # 52 from 4 to 3) or blink the coordinates, stopping the ball at  $x = 0$ \* (change step # 48 from 4 to 3 and step # 67 from 2 to 3).

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\* instead of blinking and stopping the ball at  $x = \pm 1$

# Program Description I

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Contributor's Name \_\_\_\_\_

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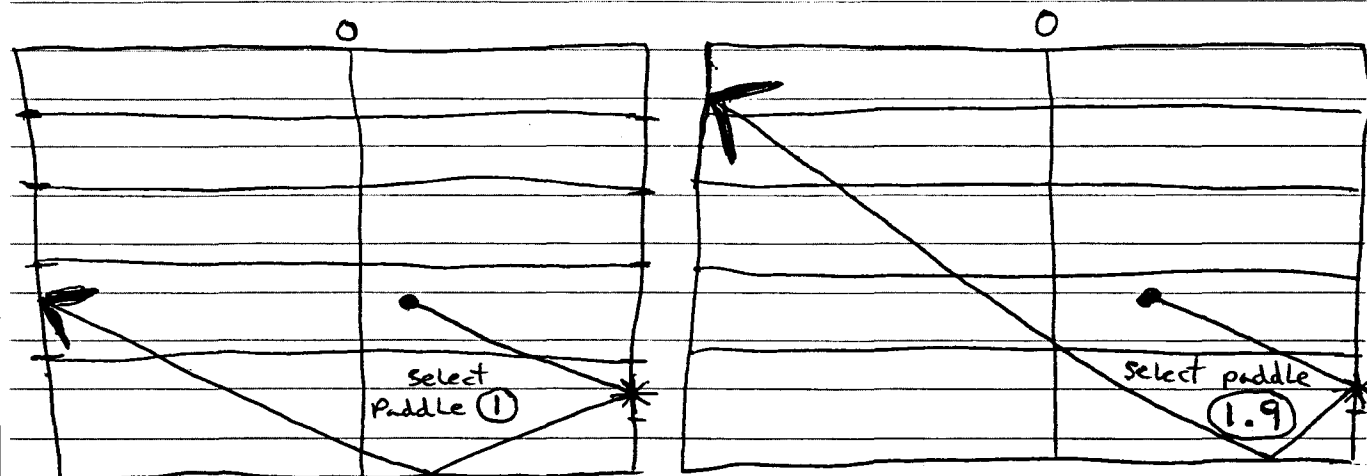
City \_\_\_\_\_

State \_\_\_\_\_

Zip Code \_\_\_\_\_

## Program Description, Equations, Variables

Players can also add their own english. In stead of specifying a paddle number as simply P, one can key in P.1 (bottom half from P to P.5) or P.9 (top half from P.5 to P+1). If you select the wrong "half", you've missed the ball and your opponent scores. If you are successful, the ball will ~~automatically~~ automatically head toward the High side of your opponent's end ( $y=4$ ,  $y=5$ ) where he'll find it more difficult to select the right paddle. Thus, compare the two paths of the ball:

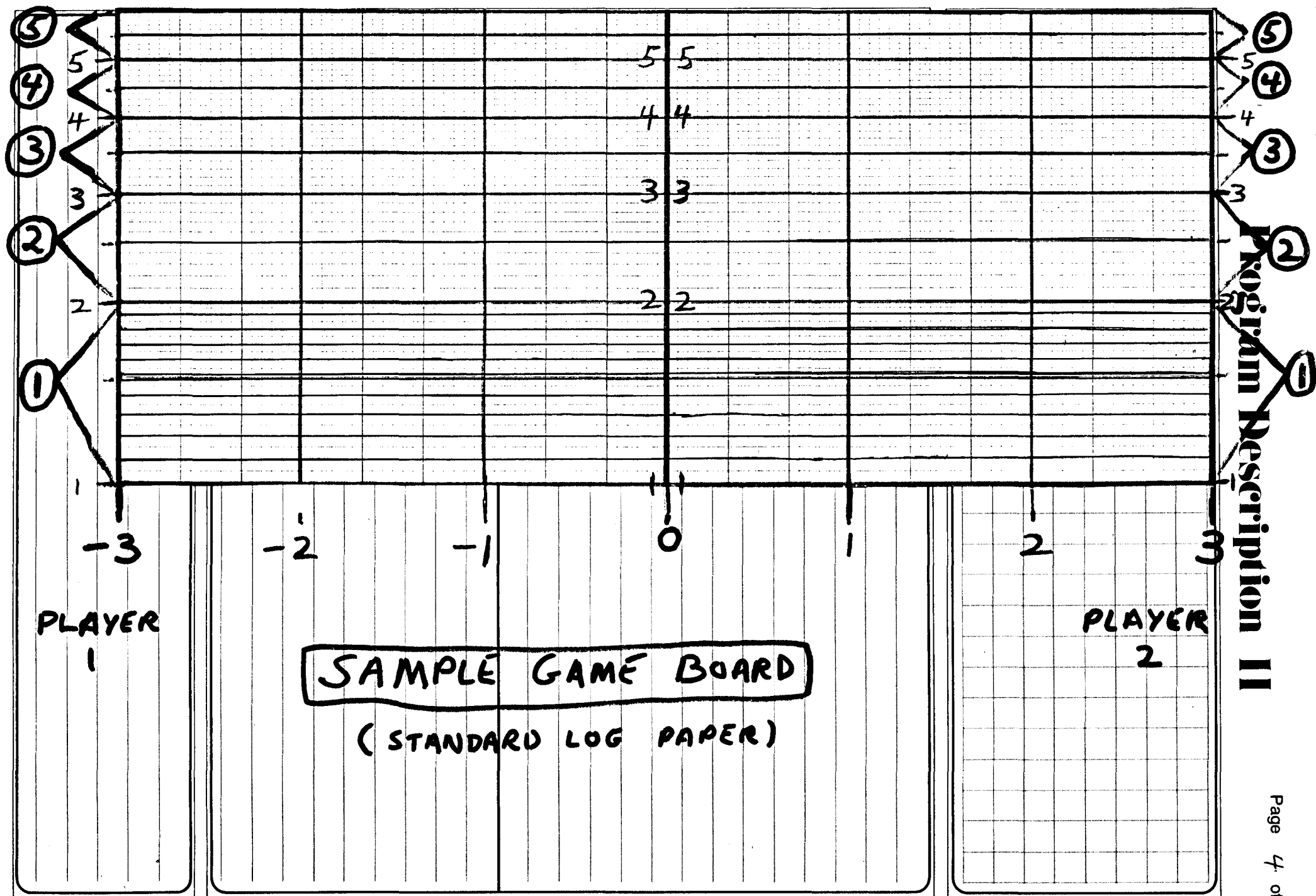


## Operating Limits and Warnings

When serving, ~~the~~ Paddle selection inputs between 0 and 1 and greater than 6 default to paddle =  $y=3$ . Inputs less than 0 cause an ERROR. Also, when receiving, you may select a paddle, say, 3; the coordinates <sup>will</sup> end up being 3.00 ± 0.3, and you still lose the point. This is because the  $y$  coordinate, 2.999..., rounded off to 3.00 in the display.

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00875D

# Program Description II

Sketch(es)

Sample Problem(s) STORE SEED: .987654321 STO C f c

Player 1	Player 2	comment	OUTPUT
1	A	serve from (-3,1)	1.00 -03, 1.50 -02, 2.26 -01, 3.39 00, 5.10 01,
	3	Select Paddle 3	4.69 02, 3.12 03, 1.83 02, 1.08 01, 1.58 00,
			2.70 -01
5		Select Paddle 5	4.59 -02, 4.60 -03, 0.01 (score)
		WRONG: score is 0 to 1	
3	E	Player 2-serve from (3,3)	3.00 03, 3.75 02, 4.68 01, 5.84 00,
			4.93 -01
3		select Paddle 3	3.95 -02, 3.16 -03, 2.26 -02, 1.62 -01,
			1.16 00, 1.21 01
2.1		select bottom half of Paddle 2	1.69 02, 2.36 03, 2.72 02, 3.15 01,
			3.63 00, 4.20 -01
5		select Paddle 5	4.85 -02, 5.60 -03, 5.38 -02, 4.50 -01,
			3.77 00, 3.16 01
2.1		select bottom half of Paddle 2	2.64 02, 2.21 03, 1.42 02,
			1.10 01, 1.72 00, 2.70 -01
5.1		select bottom half of Paddle 5	4.21 -02, 5.47 -03
			3.20 -02, 1.87 -01, 1.09 00,
			1.57 01
4.9		select top half of Paddle 4	2.69 02, 4.61 03, 4.29 02,
			2.35 01, 1.29 00, 1.41 -01
4.1		select bottom half of Paddle 4	2.57 -02, 4.68 -03, 0.02 (score)

WRONG: Player 2 is winning by a score of 2 to nothing.  
 Players decide beforehand what the winning total should be (11, for example).  
 For doubles, Partners take turns selecting a paddle.  
 For practice, one user can play "both ends of the table."

A diagram of a ping-pong table. The table is rectangular with a black border. At the top center, the words "PING PONG" are written in a simple, hand-drawn font. On the left side, there is a small square box containing a circle with a dot inside, representing a ball. To the right of this box, the word "SERVE" is written, followed by an arrow pointing towards the center of the table. In the center of the table, the words "f INIT" are written above a rectangular box containing the word "SEED". To the right of the "SEED" box, the words "f AUTO" are written above another rectangular box. To the right of this box, the word "SERVE" is written, followed by an arrow pointing towards the center of the table. On the far left and far right ends of the table, there are small black triangles pointing outwards, labeled "1" and "2" respectively.

STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1	Load sides 1 and 2.		<input type="text"/> <input type="text"/>	
2	Set AUTO MODE SO BALL WILL CONTINUE BOUNCING AROUND COURT		f e	1.00
3	STORE SEED - A number between 0 and 1 ending in the digit 1, 3, 7, or 9. (seed once stored need not be input again unless Registers are cleared or calculator turned off (i.e. f c and f e do NOT destroy the seed).	Seed	STO C	
4	To Play game, initialize (ignore this step if you want the program to run in AUTO mode)		f c	0.00
5	Player 1 (on left) serves: select initial Y coordinate (1, 2, 3, 4, or 5):	Y	A	
5a	Player 2 (on right) serves:	Y	E	Y ± 03
5b	.			Y ± 02
				Y ± 00
				Y ± 01
6	Y ≠ 01 Blinks 4 times - during one of the blinks, receiving player should select Paddle Number P (For P.0 to P.9999...), P.1 (For P.0 to P.5), or P.9 (For P.5 to P.9999...) Paddle Input	Paddle Input		Y ± 02
7	IF correct, Play continues at step 5b			Y ± 03
7a	IF Incorrect, score blinks in display Player 1 . Player 2 → (P . Q) →			P.Q
7b	Then continue at step 5 if Player 1 scored or at step 5a if Player 2 scored.			

STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
001	g LBL e	32 25 15	Auto mode		h F? 3	35 71 03	
	h SF 2	35 51 02			GTU 5	22 05	
	g LBL c	32 25 13	Initialize		RCL 7	34 07	Check Auto Flag to skip
	0	00		060	f X#0	31 61	<del>XXXXXXXXXX</del>
	STO 0	33 00			GTU 5	22 05	
	h F? 2	35 71 02	Auto mode set?		f D52	31 33	
	1	01	Yes - set R7 flag		GTU 4	22 04	
	STO 7	33 07	No - clear R7 flag.		0	00	No input - Automatic miss.
	h RTN	35 22			f LBL 5	31 25 05	
010	f LBL A	31 25 11	Player 1 serves -		STO 4	33 04	Save paddle number
	h SF 0	35 51 00	Set Flag 0 ( $x < 0$ )		2	02	
	GTU 5	22 05	( $x = -3$ )		h ST I	35 33	
	f LBL E	31 25 15	Player 2 serves		f GSB 6	31 22 06	Continue displaying
	h CF 0	35 61 00	Clear Flag 0 ( $x > 0$ )	070	h Pause	35 72	coordinates
	f LBL 5	31 25 05	( $x = +3$ )		RCL 7	34 07	check auto flag -
	f INT	31 83			f X#0	31 61	if on, skip the
	g SC1	32 23			GTU 2	22 02	paddle no. check
	f X=0	31 51	Paddle input = 0?		.	83	check for
	3	03	Default to 3		5	05	Paddle # inputs:
020	ENTER T	41			RCL 4	34 04	
	5	05	Paddle input		g frac	32 83	
	h X=y	35 52	greater than 6?		g X>y	32 81	P.9?
	g X>y	32 81			GTU fb	22 31 12	Yes - Goto fb
	3	03	Default to 3	080	f X#0	31 61	P.1?
	f LN	31 52	Paddle number = Y		GTU fa	22 31 11	Yes - Goto fa
	STO 2	33 02	STORE LN(Y) in R2		RCL 6	34 06	otherwise simply P.
	f GSB 9	31 22 09	Random number.		f INT	31 83	
	.	83			RCL 4	34 04	
	3	03			g X#y	32 61	Paddle # correct?
030	X	71			GTU 7	22 07	No - opponent scores
	.	83			f LBL 2	31 25 02	Yes - Apply
	2	02			RCL 6	34 06	natural english.
	+	61			g frac	32 83	
	STO 3	33 03	Random $\Delta Y$	090	.	83	
	f GSB 9	31 22 09			5	05	
	h CF 1	35 61 01			-	51	
	.	83			3	03	
	5	05	Randomize to get		÷	81	
	g X>y	32 81	initial vertical		h F? 1	35 71 01	
040	h SF 1	35 51 01	direction (Flag 1 set -		CH5	42	
	3	03	down; Flag 1 clear - up)		RCL 3	34 03	
	STO 1	33 01	Initialize  X .		+	61	
	1	01			.	83	
	h ST I	35 33			1	01	
	f GSB 1	31 22 01		100	g X≤y	32 71	
	h Pause	35 72	Display first set of		h X=y	35 52	
	f LBL 8	31 25 08	coordinates.		.	83	
	4	04			6	06	
	h ST I	35 33			g X>y	32 81	
050	f GSB 6	31 22 06	Continue displaying		h X=y	35 52	
	h CF 3	35 61 03	coordinates		GTU 0	22 00	
	4	04			g LBL a	32 25 11	Continue at LBL 0.
	h ST I	35 33			RCL 6	34 06	Paddle # = P.1
	f LBL 4	31 25 04			RCL 4	34 04	(lower half)
	h R↓	35 53		110	f INT	31 83	check if
	h Pause	35 72	Await Paddle # input		g X>y	32 81	successful.

## REGISTERS

0 SCORE	1 X	2 LN(Y)	3 $\Delta Y$	4 Paddle Guess	5	6 Y	7 "AUTO" FLAG	8	9
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9
A	B	C seed	D	E	F	G	H	I used	J

STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
	GTO 7	22 07	Not right - GOTO 7.		STO + 0	33 61 00	Player 2 scores.
	.	83		170	1	01	
	5	05			CHS	42	
	+	61			hSTI	35 33	
	hX $\leftrightarrow$ y	35 52			RCL 0	34 00	
	gX $\rightarrow$ y	32 81			fFIX	31 23	Blink the
	GTO 7	22 07	Not right - GOTO 7.		hPause	35 72	current score.
120	gGTO f.d	22 31 14	Continue at LBL f.d.		GTO (i)	22 24	
	gLBL b	32 25 12	Paddle # = P.9		fLBL 1	31 25 01	compute path of
	RCL 6	34 06	(upper half)		RCL 2	34 02	ball.
	RCL 4	34 04	check if successful		g $\leftarrow$ x	32 52	Y
	fINT	31 83		180	STO 6	33 06	save in R6.
	.	83			RCL 1	34 01	
	5	05			hF? 0	35 71 00	Place current
	+	61			CHS	42	Y and X
	gX $\rightarrow$ y	32 81			g10X	32 53	coordinates in
	GTO 7	22 07	Not right - GOTO 7.		X	71	display.
130	hLSTX	35 82			fDSZ	31 33	
	+	61			fX=0	31 51	X $\neq$ 0 - skip the RTN
	gX $\leftarrow$ y	32 71			hRTN	35 22	
	GTO 7	22 07	Not right - GOTO 7.		hPause	35 72	Display coordinates.
	gLBL d	32 25 14	Paddle # is correct.	190	fLBL 6	31 25 06	
	.	83	Apply english to		1	01	
	6	06	send ball to		STO -1	33 51 01	change X.
	ENTER $\uparrow$	41	opponent's high side		RCL 2	34 02	Y
	ENTER $\uparrow$	41	(Y = 3, 4, 5).		RCL 3	34 03	AY
	.	83			hF? 1	35 71 01	
140	3	03			CHS	42	
	4	04			+	61	New Y.
	RCL 6	34 06			6	06	
	+	81			fLN	31 52	
	hF? 1	35 71 01		200	gX $\leftarrow$ y	32 71	IF the ball hits
	-	51			GTO 2	22 02	the top wall, GOTO 2
	hABS	35 64			hRt	35 53	
	.	83			fX $\leq$ 0	31 71	IF the ball hits the
	1	01			hCF 1	35 61 01	bottom wall, clear
	hX $\leftrightarrow$ y	35 52			fLBL 3	31 25 03	Flag 1.
150	gX $\leftarrow$ y	32 71			hABS	35 64	
	hRt	35 54			STO 2	33 02	
	fLBL 0	31 25 00			GTO 1	22 01	Continue at LBL 1.
	STO 3	33 03	Save new AY		fLBL 2	31 25 02	IF A bounce off
	3	03			hSF 1	35 51 01	top wall - set Flag 1.
	STO 1	33 01	Reset X.	210	2	02	
	hF? 0	35 71 00	change direction		X	71	
	GTO 5	22 05	(horizontal) of		-	51	Reset Y coordinate.
	hSF 0	35 51 00	ball by changing		GTO 3	22 03	Continue at LBL 3
	GTO 8	22 08	Flag 0.		fLBL 9	31 25 09	Random number
160	fLBL 5	31 25 05	Continue at LBL 8.		RCL C	34 13	generator.
	hCF 0	35 61 00			9	09	
	GTO 8	22 08			9	09	
	fLBL 7	31 25 07	A wrong Paddle!		7	07	
	.	83		220	X	71	
	0	00			gFRAC	32 83	
	1	01			STO C	33 13	
	hF? 0	35 71 00	IF Flag 0 is set,		hRTN	35 22	
	1	01	Player 1 scores else				

LABELS					FLAGS		SET STATUS		
A	B	C	D	E	0 on: $\Delta$ X $\rightarrow$		FLAGS	TRIG	DISP
serve $\rightarrow$				$\leftarrow$ serve	off: $\Delta$ X $\leftarrow$		ON OFF		
a	✓	b	✓	e	1 on: ay $\downarrow$		0 <input type="checkbox"/> <input checked="" type="checkbox"/>	DEG <input checked="" type="checkbox"/>	FIX <input checked="" type="checkbox"/>
0	✓	1	✓	4	off: ay $\uparrow$		1 <input type="checkbox"/> <input checked="" type="checkbox"/>	GRAD <input type="checkbox"/>	SCI <input type="checkbox"/>
5	✓	6	✓	9	used		2 <input type="checkbox"/> <input checked="" type="checkbox"/>	RAD <input type="checkbox"/>	ENG <input type="checkbox"/>
		7	✓		used		3 <input type="checkbox"/> <input checked="" type="checkbox"/>		n <u>2</u>