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Paul Evenson

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# Calculation of Multiple Regression with Three Independent Variables Using a Programmable Pocket Calculator

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Agricultural Experiment Station  
South Dakota State University  
Brookings, South Dakota

# Calculation of Multiple Regression with Three Independent Variables Using a Programable Pocket Calculator

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Multiple regression is used to develop equations that describe relationships among several variables.

This paper describes a multiple regression program for an equation with one dependent and three independent variables, which was written for a Hewlett-Packard 97 programable "pocket" calculator.

Once each variable is entered, the program calculates sums, sums of squares, sums of cross-products and means of all variables, as well as the number of entries. It also computes the deter-

minant of the matrix, elements of the inverted matrix, and regression coefficients. The intercept is calculated after means of all variables are re-entered, and a predicted value for the dependent variable can be determined for any set of independent variables.

The multiple regression equation with three independent variables has the form  $\hat{Y} = a + b_1X_1 + b_2X_2 + b_3X_3$  where  $a$  is the intercept;  $b_1$ ,  $b_2$ , and  $b_3$  are regression coefficients;  $Y$  is the dependent variable; and  $X_1$ ,  $X_2$ , and  $X_3$  are independent variables.

## Calculation of Regression Coefficients

The normal equations for this multiple regression are:

$$x_1 : \Sigma x_1^2 b_1 + \Sigma x_1 x_2 b_2 + \Sigma x_1 x_3 b_3 = \Sigma x_1 y$$

$$x_2 : \Sigma x_1 x_2 b_1 + \Sigma x_2^2 b_2 + \Sigma x_2 x_3 b_3 = \Sigma x_2 y$$

$$x_3 : \Sigma x_1 x_3 b_1 + \Sigma x_2 x_3 b_2 + \Sigma x_3^2 b_3 = \Sigma x_3 y$$

where

$$\Sigma x_i^2 = \Sigma X_i^2 - \frac{(\Sigma X_i)^2}{n}$$

$$\Sigma x_i y = \Sigma X_i Y - \frac{(\Sigma X_i)(\Sigma Y)}{n}$$

$$\Sigma x_i x_j = \Sigma X_i X_j - \frac{(\Sigma X_i)(\Sigma X_j)}{n}$$

$n$  = number of entries

The following matrices are used to solve this set of equations.

$$A = \begin{bmatrix} \Sigma x_1^2 & \Sigma x_1 x_2 & \Sigma x_1 x_3 \\ \Sigma x_1 x_2 & \Sigma x_2^2 & \Sigma x_2 x_3 \\ \Sigma x_1 x_3 & \Sigma x_2 x_3 & \Sigma x_3^2 \end{bmatrix}, B = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \end{bmatrix}, \text{ and } C = \begin{bmatrix} \Sigma x_1 y \\ \Sigma x_2 y \\ \Sigma x_3 y \end{bmatrix}$$

where

$$A \cdot B = C$$

To solve for B, multiply both sides of the equation by the inverse of A,  $A^{-1}$ .

$$A^{-1} \cdot A \cdot B = C \cdot A^{-1}$$

Since  $A^{-1} \cdot A = I$ , the identity matrix, then

$$I \cdot B = C \cdot A^{-1} \text{ or } B = C \cdot A^{-1}$$

$$A^{-1} \cdot C = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix} \begin{bmatrix} \Sigma x_1 y \\ \Sigma x_2 y \\ \Sigma x_3 y \end{bmatrix} = B = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \end{bmatrix}$$

where  $a_{ij}$ 's are elements of  $A^{-1}$ .

$|A|$  is the determinant of A and is used in calculating  $A^{-1}$ .

## Calculation of the Intercept

$$\text{The intercept } a = \bar{y} - b_1 \bar{x}_1 - b_2 \bar{x}_2 - b_3 \bar{x}_3$$

where

$$\bar{y} = \frac{\Sigma Y}{n} \text{ and } \bar{x}_i = \frac{\Sigma X_i}{n}$$

# User Instructions

1

Multiple Regression (Card 1)

A & C

$X_1, X_2, X_3, Y$  Matrices |A|

2

STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1.	Enter card 1		<input type="text"/> <input type="text"/>	
2.	Do 3 - 6 for each entry		<input type="text"/> <input type="text"/>	
3.	Enter $X_1$	$X_1$	<input type="text"/> ↑ <input type="text"/>	$X_1$
4.	Enter $X_2$	$X_2$	<input type="text"/> ↑ <input type="text"/>	$X_2$
5.	Enter $X_3$	$X_3$	<input type="text"/> ↑ <input type="text"/>	$X_3$
6.	Enter Y and compute sums, sum of squares, and sum of cross-products	Y	<input type="text"/> A <input type="text"/>	Y
7.	Calculate statistics for A & C matrices		<input type="text"/> B <input type="text"/>	$\Sigma X_1$ 0
			<input type="text"/> <input type="text"/>	$\Sigma X_2$ 1
			<input type="text"/> <input type="text"/>	$\Sigma X_3$ 2
			<input type="text"/> <input type="text"/>	$\Sigma Y$ 3
			<input type="text"/> <input type="text"/>	$\Sigma X_1^2$ 4
			<input type="text"/> <input type="text"/>	$\Sigma X_2^2$ 5
			<input type="text"/> <input type="text"/>	$\Sigma X_3^2$ 6
			<input type="text"/> <input type="text"/>	$\Sigma Y^2$ 7
			<input type="text"/> <input type="text"/>	-- 8
			<input type="text"/> <input type="text"/>	n 9
			<input type="text"/> <input type="text"/>	-- A
			<input type="text"/> <input type="text"/>	$X_1$ B
			<input type="text"/> <input type="text"/>	$X_2$ C
			<input type="text"/> <input type="text"/>	$X_3$ D
			<input type="text"/> <input type="text"/>	Y E
			<input type="text"/> <input type="text"/>	-- I
			<input type="text"/> <input type="text"/>	
			<input type="text"/> <input type="text"/>	$\Sigma X_1 X_2$ 0
			<input type="text"/> <input type="text"/>	$\Sigma X_1 X_3$ 1
			<input type="text"/> <input type="text"/>	$\Sigma X_1 Y$ 2
			<input type="text"/> <input type="text"/>	$\Sigma X_2 X_3$ 3
			<input type="text"/> <input type="text"/>	$\Sigma X_2 Y$ 4
			<input type="text"/> <input type="text"/>	$\Sigma X_3 Y$ 5
			<input type="text"/> <input type="text"/>	-- 6
			<input type="text"/> <input type="text"/>	-- 7
			<input type="text"/> <input type="text"/>	-- 8
			<input type="text"/> <input type="text"/>	-- 9
			<input type="text"/> <input type="text"/>	-- A
			<input type="text"/> <input type="text"/>	$X_1$ B
			<input type="text"/> <input type="text"/>	$X_2$ C
			<input type="text"/> <input type="text"/>	$X_3$ D
			<input type="text"/> <input type="text"/>	Y E
			<input type="text"/> <input type="text"/>	-- I

(continued)

continued

STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS		OUTPUT DATA/UNITS
			<input type="text"/>	<input type="text"/>	$\Sigma x_1 x_2$ 0
			<input type="text"/>	<input type="text"/>	$\Sigma x_1 x_3$ 1
			<input type="text"/>	<input type="text"/>	$\Sigma x_1 y$ 2
			<input type="text"/>	<input type="text"/>	$\Sigma x_2 x_3$ 3
			<input type="text"/>	<input type="text"/>	$\Sigma x_2 y$ 4
			<input type="text"/>	<input type="text"/>	$\Sigma x_3 y$ 5
			<input type="text"/>	<input type="text"/>	$\Sigma x_1^2$ 6
			<input type="text"/>	<input type="text"/>	$\Sigma x_2^2$ 7
			<input type="text"/>	<input type="text"/>	$\Sigma x_3^2$ 8
			<input type="text"/>	<input type="text"/>	$\Sigma y^2$ 9
			<input type="text"/>	<input type="text"/>	-- A
			<input type="text"/>	<input type="text"/>	$X_1$ B
			<input type="text"/>	<input type="text"/>	$X_2$ C
			<input type="text"/>	<input type="text"/>	$X_3$ D
			<input type="text"/>	<input type="text"/>	Y E
			<input type="text"/>	<input type="text"/>	-- I
			<input type="text"/>	<input type="text"/>	
			<input type="text"/>	<input type="text"/>	$\Sigma X_1$ 0
			<input type="text"/>	<input type="text"/>	$\Sigma X_2$ 1
			<input type="text"/>	<input type="text"/>	$\Sigma X_3$ 2
			<input type="text"/>	<input type="text"/>	$\Sigma Y$ 3
			<input type="text"/>	<input type="text"/>	$\bar{x}_1$ 4
			<input type="text"/>	<input type="text"/>	$\bar{x}_2$ 5
			<input type="text"/>	<input type="text"/>	$\bar{x}_3$ 6
			<input type="text"/>	<input type="text"/>	y 7
			<input type="text"/>	<input type="text"/>	-- 8
			<input type="text"/>	<input type="text"/>	n 9
			<input type="text"/>	<input type="text"/>	-- A
			<input type="text"/>	<input type="text"/>	$X_1$ B
			<input type="text"/>	<input type="text"/>	$X_2$ C
			<input type="text"/>	<input type="text"/>	$X_3$ D
			<input type="text"/>	<input type="text"/>	Y E
			<input type="text"/>	<input type="text"/>	-- I
8.	Calculate determinant $ A $		C		$ A $
			<input type="text"/>	<input type="text"/>	
			<input type="text"/>	<input type="text"/>	
			<input type="text"/>	<input type="text"/>	
			<input type="text"/>	<input type="text"/>	
			<input type="text"/>	<input type="text"/>	

# User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
9.	Enter Card 2		<input type="text"/> <input type="text"/>	
10.	Calculate elements of $A^{-1}$		A <input type="text"/> <input type="text"/>	$a_{11}$ 0
			<input type="text"/> <input type="text"/>	$a_{12}$ 1
			<input type="text"/> <input type="text"/>	$a_{13}$ 2
			<input type="text"/> <input type="text"/>	$a_{21}$ 3
			<input type="text"/> <input type="text"/>	$a_{22}$ 4
			<input type="text"/> <input type="text"/>	$a_{23}$ 5
			<input type="text"/> <input type="text"/>	$a_{31}$ 6
			<input type="text"/> <input type="text"/>	$a_{32}$ 7
			<input type="text"/> <input type="text"/>	$a_{33}$ 8
			<input type="text"/> <input type="text"/>	n 9
			<input type="text"/> <input type="text"/>	-- A
			<input type="text"/> <input type="text"/>	$X_1$ B
			<input type="text"/> <input type="text"/>	$X_2$ C
			<input type="text"/> <input type="text"/>	$X_3$ D
			<input type="text"/> <input type="text"/>	Y E
			<input type="text"/> <input type="text"/>	A  I
11.	Calculate regression coefficients and store in $R_0'$ , $R_1'$ , and $R_2'$ , respectively.		B <input type="text"/> <input type="text"/>	-- T
			<input type="text"/> <input type="text"/>	$b_3$ Z
			<input type="text"/> <input type="text"/>	$b_2$ Y
			<input type="text"/> <input type="text"/>	$b_1$ X
12.	Re-enter $\bar{x}_1$	$\bar{x}_1$	f a <input type="text"/>	$\bar{x}_1$
13.	Re-enter $\bar{x}_2$	$\bar{x}_2$	R/S <input type="text"/>	$\bar{x}_2$
14.	Re-enter $\bar{x}_3$	$\bar{x}_3$	R/S <input type="text"/>	$\bar{x}_3$
15.	Re-enter $\bar{y}$	$\bar{y}$	R/S <input type="text"/>	$\bar{y}$
16.	Calculate intercept		f b <input type="text"/>	a
17.	Calculate $\hat{Y}$		<input type="text"/> <input type="text"/>	
	Enter $X_1$	$X_1$	<input type="text"/> <input type="text"/>	
	Enter $X_2$	$X_2$	<input type="text"/> <input type="text"/>	
	Enter $X_3$	$X_3$	f c <input type="text"/>	$\hat{Y}$

Example

Entry #	$X_1$	$X_2$	$X_3$	Y
1	0.94	4.22	1.58	8.23
2	1.13	3.48	1.28	8.26
3	0.61	2.20	0.64	9.33
4	1.17	2.20	0.08	8.92
5	0.93	2.25	0.38	8.89
6	1.94	2.45	1.45	8.34
7	2.12	2.62	2.31	8.51
8	1.03	2.97	3.60	9.15
9	0.67	2.90	2.59	9.40
10	0.78	2.64	1.62	9.01
11	1.10	2.64	3.16	8.77
12	1.78	2.39	0.23	8.11
13	1.54	2.76	0.76	8.00
14	1.77	2.23	1.42	8.68
15	2.22	3.35	1.86	8.11

<u>Operation</u>	<u>Output</u>
1. Enter Card I _____	0.00 ***
2. .94 (↑) _____	0.94 Ent ↑
3. 4.22 (↑) _____	4.22 Ent ↑
4. 1.58 (↑) _____	1.58 Ent ↑
5. 8.23 (A) _____	8.23 GSBA
6. 1.13 (↑) _____	1.13 Ent ↑
7. 3.48 (↑) _____	3.48 Ent ↑
8. 1.28 (↑) _____	1.28 Ent ↑
9. 8.26 (A) _____	8.26 GSBA
.	.
.	.
.	.



57.	2.22	↑	2.22	Ent	↑
58.	3.35	↑	3.35	Ent	↑
59.	1.86	↑	1.86	Ent	↑
60.	8.11	A	8.11	GSBA	
61.		B		GSBB	

$\Sigma X_1$	19.73	0
$\Sigma X_2$	41.30	1
$\Sigma X_3$	22.96	2
$\Sigma Y$	129.71	3
$\Sigma X_1^2$	29.95	4
$\Sigma X_2^2$	118.22	5
$\Sigma X_3^2$	50.52	6
$\Sigma Y^2$	1124.65	7
	0.00	8
n	15.00	9
	0.00	A
used	2.22	B
used	3.35	C
used	1.86	D
used	8.11	E
	0.00	I
$\Sigma X_1 X_2$	54.07	0
$\Sigma X_1 X_3$	29.88	1
$\Sigma X_1 Y$	168.21	2
$\Sigma X_2 X_3$	66.03	3
$\Sigma X_2 Y$	355.72	4
$\Sigma X_3 Y$	200.34	5
	0.00	6
	0.00	7
	0.00	8
	0.00	9
	0.00	A
used	2.22	B
used	3.35	C
used	1.86	D
used	8.11	E
	0.00	I

$\Sigma x_1 x_2$	-0.25	0
$\Sigma x_1 x_3$	-0.32	1
$\Sigma x_1 y$	-2.40	2
$\Sigma x_2 x_3$	2.82	3
$\Sigma x_2 y$	-1.42	4
$\Sigma x_3 y$	1.80	5
$\Sigma x_1^2$	4.00	6
$\Sigma x_2^2$	4.51	7
$\Sigma x_3^2$	15.37	8
$\Sigma y^2$	3.00	9
	0.00	A
used	2.22	B
used	3.35	C
used	1.86	D
used	8.11	E
	0.00	I
$\Sigma X_1$	19.73	0
$\Sigma X_2$	41.30	1
$\Sigma X_3$	22.96	2
$\Sigma Y$	129.71	3
$\bar{x}_1$	1.32	4
$\bar{x}_2$	2.75	5
$\bar{x}_3$	1.53	6
$\bar{y}$	8.65	7
	0.00	8
n	15.00	9
	0.00	A
used	2.22	B
used	3.35	C
used	1.86	D
used	8.11	E
	0.00	I

62.

C

GSBC

|A|

244.83 \*\*\*

63. Enter Card 2

64.	<b>A</b>			GSBA
		$a_{11}$ of $A^{-1}$	0.25	0
		$a_{12}$ of $A^{-1}$	0.01	1
		$a_{13}$ of $A^{-1}$	2.890104573-03	2
		$a_{21}$ of $A^{-1}$	0.01	3
		$a_{22}$ of $A^{-1}$	0.25	4
		$a_{23}$ of $A^{-1}$	-0.05	5
		$a_{31}$ of $A^{-1}$	2.890104573-03	6
		$a_{32}$ of $A^{-1}$	-0.05	7
		$a_{33}$ of $A^{-1}$	0.07	8
		n	15.00	9
			0.00	A
		used	2.22	B
		used	3.35	C
		used	1.86	D
		used	8.11	E
		A	244.83	I

65. **B** \_\_\_\_\_ GSBB

used	-0.01	T
$b_3$	0.19	Z
$b_2$	-0.47	Y
$b_1$	-0.62	X

66.	1.32	<b>f</b>	<b>a</b>	_____	$\bar{x}_1$	1.32	GSBa
67.	2.75	<b>R/S</b>		_____	$\bar{x}_2$	2.75	R/S
68.	1.53	<b>R/S</b>		_____	$\bar{x}_3$	1.53	R/S
69.	8.65	<b>R/S</b>		_____	$\bar{y}$	8.65	R/S
70.	<b>f</b>	<b>b</b>		_____			GSBb
					a	10.46	***
71.	1.00	<b>↑</b>		_____	$X_1$	1.00	Ent ↑
72.	3.00	<b>↑</b>		_____	$X_2$	3.00	Ent ↑
73.	1.50	<b>f</b>	<b>c</b>	_____	$X_3$	1.50	GSBc
					$\hat{Y}$	8.72	***

Therefore,  $\hat{Y} = 10.46 - 0.62 X_1 - 0.47 X_2 + 0.19 X_3$   
 When  $X_1 = 1.00$ ,  $X_2 = 3.00$ , and  $X_3 = 1.50$ ;  $\hat{Y} = 8.72$

# Example

## Card 1

.94 ENT↑	2.23 ENT↑
4.22 ENT↑	1.42 ENT↑
1.58 ENT↑	8.68 GSBA
8.23 GSBA	2.22 ENT↑
1.13 ENT↑	3.35 ENT↑
3.48 ENT↑	1.86 ENT↑
1.28 ENT↑	8.11 GSBA
8.26 GSBA	GSBB
.61 ENT↑	
2.20 ENT↑	19.73 0
.64 ENT↑	41.30 1
9.33 GSBA	22.96 2
1.17 ENT↑	129.71 3
2.20 ENT↑	29.95 4
.08 ENT↑	118.22 5
8.92 GSBA	50.52 6
.93 ENT↑	1124.65 7
2.25 ENT↑	0.00 8
.38 ENT↑	15.00 9
8.89 GSBA	0.00 A
1.94 ENT↑	2.22 B
2.45 ENT↑	3.35 C
1.45 ENT↑	1.86 D
8.34 GSBA	8.11 E
2.12 ENT↑	0.00 I
2.62 ENT↑	
2.31 ENT↑	
8.51 GSBA	54.07 0
1.03 ENT↑	29.88 1
2.97 ENT↑	168.21 2
3.60 ENT↑	66.03 3
9.15 GSBA	355.72 4
.67 ENT↑	200.34 5
2.90 ENT↑	0.00 6
2.59 ENT↑	0.00 7
9.40 GSBA	0.00 8
.78 ENT↑	0.00 9
2.64 ENT↑	0.00 A
1.62 ENT↑	2.22 B
9.01 GSBA	3.35 C
1.10 ENT↑	1.86 D
2.64 ENT↑	8.11 E
3.16 ENT↑	0.00 I
8.77 GSBA	
1.78 ENT↑	
2.39 ENT↑	
.23 ENT↑	
8.11 GSBA	
1.54 ENT↑	
2.76 ENT↑	
.76 ENT↑	
8.00 GSBA	
1.77 ENT↑	

## Card 2

			GSBA
			0.25 0
			0.01 1
		2.890104573-03	2
			0.01 3
			0.25 4
			-0.05 5
		2.890104573-03	6
			-0.05 7
			0.07 8
			15.00 9
			0.00 A
			2.22 B
			3.35 C
			1.86 D
			8.11 E
			0.00 I
		19.73 0	
		41.30 1	
		22.96 2	
		129.71 3	
		1.32 4	
		2.75 5	
		1.53 6	
		8.65 7	
		0.00 8	
		15.00 9	
		0.00 A	
		2.22 B	
		3.35 C	
		1.86 D	
		8.11 E	
		0.00 I	
			1.32 GSBA
			2.75 R/S
			1.53 R/S
			8.65 R/S
			GSBA
			10.46 ***
			1.00 ENT↑
			3.00 ENT↑
			1.50 GSBA
			8.72 ***
		GSBC	
		244.83 ***	

# Program - Card 1

001	*LBLA	21 11	061	RCL4	36 04	121	RCL2	36 02	181	RCL1	36 01
002	STOE	35 15	062	RCL0	36 00	122	RCL9	36 09	182	x	-35
003	R↓	-31	063	RCL9	36 09	123	÷	-24	183	x	-35
004	STOD	35 14	064	÷	-24	124	x	-35	184	2	02
005	R↓	-31	065	STO4	35 04	125	-	-45	185	x	-35
006	STOC	35 13	066	X <sup>2</sup>	53	126	P <sup>2</sup> S	16-51	186	+	-55
007	R↓	-31	067	RCL9	36 09	127	STO1	35 01	187	RCL1	36 01
008	STOB	35 12	068	x	-35	128	RCL2	36 02	188	X <sup>2</sup>	53
009	ST+0	35-55 00	069	-	-45	129	P <sup>2</sup> S	16-51	189	RCL7	36 07
010	X <sup>2</sup>	53	070	P <sup>2</sup> S	16-51	130	RCL0	36 00	190	x	-35
011	ST+4	35-55 04	071	STO6	35 06	131	RCL3	36 03	191	-	-45
012	R↑	16-31	072	P <sup>2</sup> S	16-51	132	RCL9	36 09	192	RCL0	36 00
013	ST+1	35-55 01	073	RCL5	36 05	133	÷	-24	193	X <sup>2</sup>	53
014	X <sup>2</sup>	53	074	RCL1	36 01	134	x	-35	194	RCL8	36 08
015	ST+5	35-55 05	075	RCL9	36 09	135	-	-45	195	x	-35
016	R↑	16-31	076	÷	-24	136	P <sup>2</sup> S	16-51	196	-	-45
017	ST+2	35-55 02	077	STO5	35 05	137	STO2	35 02	197	RCL3	36 03
018	X <sup>2</sup>	53	078	X <sup>2</sup>	53	138	RCL3	36 03	198	X <sup>2</sup>	53
019	ST+6	35-55 06	079	RCL9	36 09	139	P <sup>2</sup> S	16-51	199	RCL6	36 06
020	R↑	16-31	080	x	-35	140	RCL1	36 01	200	x	-35
021	ST+3	35-55 03	081	-	-45	141	RCL2	36 02	201	-	-45
022	X <sup>2</sup>	53	082	P <sup>2</sup> S	16-51	142	RCL9	36 09	202	STO1	35 46
023	ST+7	35-55 07	083	STO7	35 07	143	÷	-24	203	PRTX	-14
024	RCL9	36 09	084	P <sup>2</sup> S	16-51	144	x	-35	204	RTN	24
025	1	01	085	RCL6	36 06	145	-	-45	205	R/S	51
026	+	-55	086	RCL2	36 02	146	P <sup>2</sup> S	16-51			
027	STO9	35 09	087	RCL9	36 09	147	STO3	35 03			
028	P <sup>2</sup> S	16-51	088	÷	-24	148	RCL4	36 04			
029	RCLB	36 12	089	STO6	35 06	149	P <sup>2</sup> S	16-51			
030	RCLC	36 13	090	X <sup>2</sup>	53	150	RCL1	36 01			
031	x	-35	091	RCL9	36 09	151	RCL3	36 03			
032	ST+0	35-55 00	092	x	-35	152	RCL9	36 09			
033	RCLB	36 12	093	-	-45	153	÷	-24			
034	RCLD	36 14	094	P <sup>2</sup> S	16-51	154	x	-35			
035	x	-35	095	STO8	35 08	155	-	-45			
036	ST+1	35-55 01	096	P <sup>2</sup> S	16-51	156	P <sup>2</sup> S	16-51			
037	RCLB	36 12	097	RCL7	36 07	157	STO4	35 04			
038	RCLC	36 15	098	RCL3	36 03	158	RCL5	36 05			
039	x	-35	099	RCL9	36 09	159	P <sup>2</sup> S	16-51			
040	ST+2	35-55 02	100	÷	-24	160	RCL2	36 02			
041	RCLC	36 13	101	STO7	35 07	161	RCL3	36 03			
042	RCLD	36 14	102	X <sup>2</sup>	53	162	RCL9	36 09			
043	x	-35	103	RCL9	36 09	163	÷	-24			
044	ST+3	35-55 03	104	x	-35	164	x	-35			
045	RCLC	36 13	105	-	-45	165	-	-45			
046	RCLC	36 13	106	P <sup>2</sup> S	16-51	166	P <sup>2</sup> S	16-51			
047	x	-35	107	STO9	35 09	167	STO5	35 05			
048	ST+4	35-55 04	108	RCL0	36 00	168	PREG	16-13			
049	RCLD	36 14	109	P <sup>2</sup> S	16-51	169	P <sup>2</sup> S	16-51			
050	RCLC	36 15	110	RCL0	36 00	170	PREG	16-13			
051	x	-35	111	RCL1	36 01	171	RTN	24			
052	ST+5	35-55 05	112	RCL9	36 09	172	*LBLC	21 13			
053	P <sup>2</sup> S	16-51	113	÷	-24	173	P <sup>2</sup> S	16-51			
054	RCL9	36 09	114	x	-35	174	RCL6	36 06			
055	RTN	24	115	-	-45	175	RCL7	36 07			
056	*LBLB	21 12	116	P <sup>2</sup> S	16-51	176	RCL8	36 08			
057	PREG	16-13	117	STO0	35 00	177	x	-35			
058	P <sup>2</sup> S	16-51	118	RCL1	36 01	178	x	-35			
059	PREG	16-13	119	P <sup>2</sup> S	16-51	179	RCL0	36 00			
060	P <sup>2</sup> S	16-51	120	RCL0	36 00	180	RCL3	36 03			

# Program - Card 2

001	*L2LA	21 11	061	PzS	16-51	121	RCL0	36 00	181	RCL4	36 04
002	RCL7	36 07	062	RCL6	36 06	122	RCLC	36 13	182	x	-35
003	RCL8	36 08	063	RCL3	36 03	123	x	-35	183	-	-45
004	x	-35	064	x	-35	124	RCL1	36 01	184	RCL2	36 02
005	RCL3	36 03	065	RCL1	36 01	125	RCLD	36 14	185	RCL5	36 05
006	X <sup>2</sup>	53	066	RCL0	36 00	126	x	-35	186	x	-35
007	-	-45	067	x	-35	127	RCL2	36 02	187	-	-45
008	RCLI	36 46	068	-	-45	128	RCLE	36 15	188	ST07	35 07
009	÷	-24	069	RCLI	36 46	129	x	-35	189	PRTX	-14
010	PzS	16-51	070	÷	-24	130	+	-55	190	RTN	24
011	ST00	35 00	071	PzS	16-51	131	+	-55	191	*LBLc	21 16 13
012	PzS	16-51	072	CHS	-22	132	PzS	16-51	192	RCL2	36 02
013	RCL0	36 00	073	ST05	35 05	133	ST00	35 00	193	x	-35
014	RCL8	36 08	074	PzS	16-51	134	PzS	16-51	194	ST08	35 08
015	x	-35	075	RCL0	36 00	135	RCL3	36 03	195	R4	-31
016	RCL1	36 01	076	RCL3	36 03	136	RCLC	36 13	196	RCL1	36 01
017	RCL3	36 03	077	x	-35	137	x	-35	197	x	-35
018	x	-35	078	RCL7	36 07	138	RCL4	36 04	198	ST+8	35-55 00
019	-	-45	079	RCL1	36 01	139	RCLD	36 14	199	R4	-31
020	RCLI	36 46	080	x	-35	140	x	-35	200	RCL0	36 00
021	÷	-24	081	-	-45	141	RCL5	36 05	201	x	-35
022	PzS	16-51	082	RCLI	36 46	142	RCLE	36 15	202	ST+8	35-55 00
023	CHS	-22	083	÷	-24	143	x	-35	203	RCL7	36 07
024	ST01	35 01	084	PzS	16-51	144	+	-55	204	RCL8	36 08
025	PzS	16-51	085	ST06	35 06	145	+	-55	205	+	-55
026	RCL0	36 00	086	PzS	16-51	146	PzS	16-51	206	PRTX	-14
027	RCL3	36 03	087	RCL6	36 06	147	ST01	35 01	207	RTN	24
028	x	-35	088	RCL3	36 03	148	PzS	16-51	208	R/S	51
029	RCL1	36 01	089	x	-35	149	RCL6	36 06			
030	RCL7	36 07	090	RCL0	36 00	150	RCLC	36 13			
031	x	-35	091	RCL1	36 01	151	x	-35			
032	-	-45	092	x	-35	152	RCL7	36 07			
033	RCLI	36 46	093	-	-45	153	RCLD	36 14			
034	÷	-24	094	RCLI	36 46	154	x	-35			
035	PzS	16-51	095	÷	-24	155	RCL8	36 08			
036	ST02	35 02	096	PzS	16-51	156	RCLE	36 15			
037	PzS	16-51	097	CHS	-22	157	x	-35			
038	RCL0	36 00	098	ST07	35 07	158	+	-55			
039	RCL8	36 08	099	PzS	16-51	159	+	-55			
040	x	-35	100	RCL6	36 06	160	PzS	16-51			
041	RCL3	36 03	101	RCL7	36 07	161	ST02	35 02			
042	RCL1	36 01	102	x	-35	162	RCL1	36 01			
043	x	-35	103	RCL0	36 00	163	RCL0	36 00			
044	-	-45	104	X <sup>2</sup>	53	164	PRST	16-14			
045	RCLI	36 46	105	-	-45	165	RTN	24			
046	÷	-24	106	RCLI	36 46	166	*LBLa	21 16 11			
047	PzS	16-51	107	÷	-24	167	ST03	35 03			
048	CHS	-22	108	PzS	16-51	168	R/S	51			
049	ST03	35 03	109	ST08	35 08	169	ST04	35 04			
050	PzS	16-51	110	PREG	16-13	170	R/S	51			
051	RCL6	36 06	111	RTN	24	171	ST05	35 05			
052	RCL8	36 08	112	*LBLB	21 12	172	R/S	51			
053	x	-35	113	PzS	16-51	173	ST06	35 06			
054	RCL1	36 01	114	RCL2	36 02	174	RTN	24			
055	X <sup>2</sup>	53	115	ST0C	35 13	175	*LBLb	21 16 12			
056	-	-45	116	RCL4	36 04	176	RCL0	36 00			
057	RCLI	36 46	117	ST0D	35 14	177	RCL3	36 03			
058	÷	-24	118	RCL5	36 05	178	x	-35			
059	PzS	16-51	119	ST0E	35 15	179	-	-45			
060	ST04	35 04	120	PzS	16-51	180	RCL1	36 01			

