



51403 Program Description I

Program Title 97-DOUBLE PRECISION ARITHMETIC
FOR POSITIVE INTEGERS
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Program Description, Equations, Variables INTEGERS OF MAXIMUM 18
DIGITS ARE DENOTED AS $a \cdot 10^9 + b$, WHERE
 a AND b HAVE MAX. 9 DIGITS. IF THE INTEGER IS
SMALLER THAN 10^9 ONLY PART b HAS TO BE
ENTERED, BECAUSE CALCULATIONS ALWAYS LEAVE
ZERO IN NORMAL X REGISTER. PARTS a ARE ALWAYS
STORED IN SECONDARY AND PARTS b IN PRIMARY
REGISTERS. Y AND X ARE USED FOR INTERMITTENT
STORAGE OF a RESP. b . BECAUSE FLAG #3 IS
SET EVERY TIME A NUMBER IS ENTERED NORMAL
STACK OPERATION IS USED; THAT IS IF A NUMBER
HAS BEEN INPUTTED AND YOU PRESS AN OPERATION
LABEL (+, -, x, ÷), THE VIRTUAL STACK IS FIRST
LIFTED, THEN X & Y TRANSFERRED

S9	9	S	TO REGISTERS 6 AND S6, AND FINALLY
S8	8	W	IS THE OPERATION MADE FOR REGIS-
S7	7	V	TERS 6, S6 AND 7, S7. (W→S; V→W, U→V
S6	6	U	X&Y STO U. V U OPERATION)

NOTE THAT IN THIS DESCRIPTION S, W, V, U IS USED, ON PROGRAM CARDS X&Y

Operating Limits and Warnings THE PRINTING OF REMAINDER IN DIVISION
IS AN INDICATION THAT THERE IS ONE, IT IS NOT
NECESSARY CORRECT. IN ORDER TO OBTAIN THE
CORRECT REMAINDER: ENTER CARD #2, * DIVISOR, ENT,
QUOTIENT, X; ENTER CARD #1, = AND YOU HAVE
THE CORRECT REMAINDER IN REGISTER X.
PLEASE READ ABSTRACT P * DIVIDEND, ENT

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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Sketch(es)

Sample Problem(s) $((986369852147 \times 753241) + 123456) \div 753241 = ?$

NOTE REMAINDER SHIFTED 4 DIGITS TO THE LEFT

CHECK FOR SOME KNOWN EQUATION, FOR INSTANCE

$$(A^3 + A^2B - AB^2 - B^3) \div (A - B) = (A + B)^2$$

NOTE $B < A < 600000$ EXAMPLE $A = 587412$ $B = 90603$

#1, CLX, STOI, 587412, fd, fe, fe, fe, fe, #2, D, D, C, C
#1, 1STOI, 0, ENT, 90603, fd, fe, #2, D, #1, D, STOI, fe, 1STOI,
fe, fe, #2, D, D, #1, E, 1, STOI, fe, fe, fe, #2, D, D, #1,
E, 1STOI, fe, 0, STOI, fe, fb, E, #3, E, $\Rightarrow 459704340225$

#1

0, STOI, fe, 1STOI, fe, D, R, A, #2 D $\Rightarrow 459704340225$

Solution(s) 386- ENT1
353652147- GSBH
753241- GSBH
MULTIPLI-
CAND
MULTIPLICATOR

742.9742130+15- ***
801058427- ***
PRODUCT = AUGEND

123456- GSBH ADDEND

742.9742130+15- ***

801181883- ***

753241- GSBH DIVISOR

1234560000- *** "REMAINDER"

986.0000000+09- ***
369852147- ***
QUOTIENT

0. STOI #2

GSBe

1. STOI

GSBe

GSBe

GSBe

GSBe

GSBe

GSBe

GSBe

GSBe

GSBe

GSBe

GSBe

GSBe

Reference(s)

CHECK

678015- ***

R

GSBe ENT

GSBe #2

459.0000000+09- ***

MULTPLY

704340225- ***

704340225- ***

704340225- ***

587412. GSBH

345.0000000+09 ***

52857744. ***

282.6881850+15 ***

273112523. ***

345.0000000+09 ***

52857744. ***

31.26282400+15 ***

70179632. ***

233.9510130+15 ***

343298160. ***

8.000000000+09 ***

209903605. ***

4.822008000+15 ***

486765-08. ***

229.1290040+15 ***

856528252. ***

8.000000000+09 ***

202903509. ***

743.7510000+12 ***

293686227. ***

228.3852530+15 ***

562643025. ***

496509. ***

459.0000000+09 ***

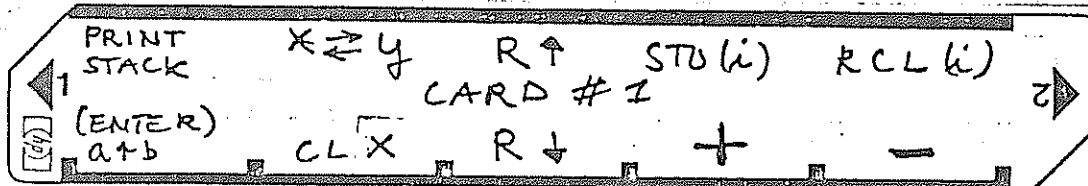
704340225. ***



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User Instructions

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STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1	LOAD SIDE 1 AND 2			
2	IF YOU HAVE USED THE CALCULATOR FOR SOME OTHER CALCULATIONS (NOT DOUBLE PRECISION) CLEAR MEMORY AND NORMAL STACK		CLREG PDS CLREG CLX ENT ENT	0.
3	TO ENTER INTEGERS IN VIRTUAL STACK.	a b	ENT A	a 0.
3a	TO ENTER INTEGERS WITH a=0 IF (x) = 0	b	A	0.
4	DO CALCULATION	a1 b1	ENT D	R a1 PRINT SUM 0.
5	DO CALCULATION	a2 b2	ENT E	a2 PRINT DIFF. 0.
6	IF YOU WISH TO ADD (W) AND (V) AND SAVE (U) FOR FUTURE USE IN REGISTER 4.	4	STO ↓ ↓ ↓	4 0. (U) mib 0.
6a	STORE ROLL DOWN ADD		f D C D	0. 0. 0.
6b	ALTERNATIVE TO 6a CLX ADD ADD		B D D	0. PRINT SUM 0. PRINT SUM 0.
NOTES: INDEX REGISTER IS USED DURING THE CALCULATIONS AND I MUST BE ENTERED BEFORE STO AND RCL. RCL STORES (I) INTO U AND LIFTS STACK				



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Program Listing I

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STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
001	001 *LCLB		ENTER.	057	STO6		
	002 CF3		IF LAST OPERA-	058	R+		(U) → V
	003 F02		TION WAS CLX	059	STO7		(V) → U
	004 ST05		STORE NEW NUMBER	060	R+		
	005 GT08		IN U WITHOUT STACK LIFT	061	P+S		
	006 *LCLB		CLX	062	F2?		
	007 CF3			063	GT01		
	008 GSB0		TO CLEAR U, FIRST	064	SF2		
	009 0		ROLL STACK DOWN,	065	GT06		
010	010 ENT+		THEN LIFT STACK	066	*LCL0		ROLL UP
	011 ENT+		AND FINALLY	067	CF0		(U) → V
	012 GSEA		WRITE OVER.	068	RCL9		(V) → W
	013 SF0			069	RCL8		(W) → S
	014 0			070	ST09		(S) → U
	015 RTN			071	RCL7		
	016 *LCL0		ROLL DOWN	072	ST08		
	017 CF0			073	RCL6		
	018 RCL6		(U) → S	074	ST07		
	019 RCL7		(V) → U	075	R+		
020	020 ST06		(W) → V	076	ST06		
	021 RCL8		(S) → W	077	P+S		
	022 ST07			078	F2?		
	023 RCL9			079	GT01		
	024 ST08			080	SF2		
	025 R+			081	GT06		
	026 ST09			082	*LCL0		STORE
	027 P+S			083	CF0		X & Y INTO
	028 F2?			084	GSB2		VIRTUAL
	029 GT01			085	ST01		REGISTER I
30	030 SF2			086	R+		
	031 GT00			087	P+S		
	032 *LCL0			088	ST01		
	033 SF0		ADDITION FLAG	089	P+S		
	034 GT07			090	GT01		
	035 *LCL0			091	*LCL0		RECALL
	036 CF0		SUBTRACTION	092	GSB2		VIRTUAL
	037 SF1		FLAG	093	P+S		REGISTER I
	038 GT07			094	RCL1		INTO U
	039 *LCL0		PRINT	095	P+S		LIFT STACK
040	040 SPC		VIRTUAL	096	RCL1		BUT NOT
	041 5		STACK	097	F02		AFTER CLX
	042 ST01			098	GT09		
	043 GSB3			099	GT08		
	044 DSZ1			100	*LCL1		SET UP ZERO
	045 GSB3			101	0		DISPLAY
	046 DSZ1			102	RTN		
	047 GSB3			103	*LCL2		
	048 DSZ1			104	CF3		CHECK THAT
	049 GSB3			105	5		STORAGE
050	050 ST01			106	RCL1		DOES NOT
	051 SPC			107	X > Y?		GO INTO
	052 RTN			108	GT00		UVWS
	053 *LCL0		EXCHANGE X & Y	109	X < 0?		
	054 CF0			110	GT00		
	055 RCL6			111	R+		
	056 RCL7			112	R+		

REGISTERS

0	1	2	3	4	5	6	7	8	9
S	T	O	R	A	G	E	U	V	W
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9

A	B USED IN CARD #3	C USED IN CARD #2 & #3	D USED IN CARD #2 & #3	E USED IN CARD #2 & #3	I INDEX
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51403 Program Listing II

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STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
113	RTN			169	INT		CARRY
114	*LBL3			170	P2S		
115	ENG		PRINT	171	1		BORROW
116	OSP9		ROUTINE	172	-		DIGIT
117	P2S			173	RCL7		
118	RCL7			174	+		
119	EEX		PRINT a IF	175	RCL6		
120	9		a ≠ 0, OTHER-	176	F09		
121	X		WISE PRINT	177	+		
122	X=02		SPACE	178	F12		
123	FRTX			179	-		
124	X=02			180	180 GSB6		
125	SPC			181	GSB9		
126	P2S			182	P2S		
127	FIX			183	CF0		
128	OSP0			184	CF1		
129	RCL7		PRINT b	185	6		
130	FRTX		NOTE NORMAL	186	STOI		
131	0		STACK T 2	187	GSB3		PRINT RESULT
132	RTN		Z b	188	STOI		
133	*LBL4		Y a	189	RTN		
134	*LBL5		X 0	190	190 *LBL6		STACK LIFT
135	CF0		OPTIONAL LABEL	191	RCL8		
136	GT09		CLEAR OF	192	STO9		
137	*LBL6		CLX MEMORY	193	R4		
138	RCL8			194	RCL7		
139	STO7		(S) → S	195	STO8		
140	R4		(S) → W	196	R4		
141	RCL9		(W) → V	197	RCL6		
142	STO8			198	STO7		
143	R4		STACK	199	R4		
144	P2S		DOWN	200	200 P2S		
145	F22			201	F22		
146	RTN			202	GT09		
147	SF2			203	SF2		
148	GT06			204	GT08		
149	*LBL7		ADDITION &	205	*LBL9		NEW (U)
150	F32		SUBTRACTION	206	STO6		
151	GSB8		SUBROUTINE	207	P2S		
152	RCL7			208	R4		
153	RCL6			209	STO6		
154	F09			210	P2S		
155	+			211	GT01		
156	F12						
157	-						
158	EEX						
159	9						
160	-						
161	1		BORROW DIGIT IS				
162	+		ALWAYS USED				
163	ENT1						
164	FRG						
165	EEX						
166	-						
167	X						
168	X2Y						

LABELS					FLAGS	SET STATUS		
A PRINT STACK	B (X2Y)	C R4	D STO (U)	E RCL (i)	ADD/CLX MEMORY	FLAGS	TRIG	DISP
4 ENTER	8 CLX (U)	C RV	D ADD	E SUBTR	1 SUBTR	ON OFF		
0 ERROR	11 ZERO DISPL.	2 INDEX SUB ROUT.	3 PRINT	4 OPTIONAL	2 USED	0 ☐ ☒	DEG ☒	FIX ☒
5 CLX MEM	6 STACK DOWN	7 ADD SUBTR	8 LIFT STACK	9 WRITE OVER	3 NUMBER INPUT	1 ☐ ☒	GRAD ☐	SCI ☐
						2 ☐ ☒	RAD ☐	ENG ☐
						3 ☐ ☒		n 0



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STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1	LOAD SIDE 1 AND 2			
2	IF YOU HAVE USED THE CALCULATOR FOR SOME OTHER CALCULATIONS (NOT DOUBLE PRECISION) CLEAR MEMORY AND NORMAL STACK		☒ CLREG ☒ CLREG ☒ CLX ☒ ENT ☒ ENT ☒ ENT	0. 0.
3	TO ENTER INTEGERS IN VIRTUAL STACK	a b	☒ ENT A	a 0.
3a	TO ENTER INTEGERS WITH $a \neq 0$ (IF $(X) = 0$)	b	A	0.
4	DO CALCULATION = DO MULTIPLICATION	a1 b1	ENT D	a1 PRINT PRODUCT 0.
5	FOR A NEW CALCULATION GOTO STEP 3			
6a	IF YOU WANT TO STORE RESULT IN STORAGE REGISTER - I ENTER CARD #1, PRESS $\frac{1}{d}$	I	R $\frac{1}{d}$ STO I R $\frac{1}{d}$	PROD I PROD
7a	TO CLEAR RESULT		B	0.
7b	TO CLEAR BEFORE A NEW INPUT	a2 b2	C ENT D	0.
STEPS 6a, 7a, 7b ARE OPTIONAL				



REGISTERS

0	1	2	3	4	5	6	7	8	9
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9
S	T	O	R	A	G	E	U	V	W
A	B	C	D	E	F	G	H	I	J
		USED	USED	USED					



MULTIPLYC3 Program Listing II

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STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS	
113	RT			169	P2S			
114	+			170	F2?			
115	RTN			171	RTN			
116	*LBL3		PRINT	172	SF2			
117	END		ROUTINE	173	GT06			
118	DSFS			174	*LBL7			
119	P2S			175	RCL7		ADD SUB-	
120	RCL6			176	RCL6		ROUTINE	
121	EEX			177	+			
122	9			178	EEX			
123	X			179	9			
124	X#0?			180	÷			
125	FRTX			181	ENT↑			
126	P2S			182	FRC			
127	FIX			183	EEX			
128	DSPO			184	9			
129	RCL6			185	X			
130	FRTX			186	ST06			
131	SPC			187	X2Y			
132	0			188	INT			
133	RTN			189	P2S			
134	*LBL4		INTEGER	190	RCL7			
135	1		INTG TWO	191	RCL6			
136	0		PARTS	192	+			
137	÷			193	+			
138	ENT↑			194	ST06			
139	INT			195	P2S			
140	X2Y			196	RTN			
141	FRC			197	*LBL8		STACK	
142	EEX			198	RCL8		LIFT	
143	9			199	ST09			
144	X			200	R↓			
145	RTN			201	RCL7			
146	*LBL5		TWO INTEGERS	202	ST08			
147	EEX		IN STACK REGIS-	203	R↓			
148	4		TERS Y AND X	204	RCL6			
149	÷		ARE DIVIDED	205	ST07			
150	ENT↑		INTO TWO PARTS	206	R↓			
151	FRC			207	P2S			
152	X2Y		AFTER THIS	208	F2?			
153	INT		ROUTINE CONTENTS	209	GT09			
154	R↑		OF STACK IS	210	SF2			
155	F2?			211	GT08			
156	RTN		T YYYYY,0	212	*LBL9		NEW (U)	
157	CLX		Z 0XXXX	213	ST06			
158	R↑		Y XXXXX,0	214	P2S			
159	+		X 0YYYY	215	R↓			
160	SF2			216	ST06			
161	GT05			217	R↑			
162	*LBL6		STACK	218	P2S			
163	RCL8		DOWN	219	0			
164	ST07			220	RTN			
165	R↓		(S) → S	221	R/S			
166	RCL9		(S) → W	222	R/S			
167	ST08		(W) → V	223	R/S			
168	R↓			224	R/S			
LABELS				SET STATUS				
A ENTER	B CLX (U)	C R↓	D MULTIPLY	E	F CLX MEM.	FLAGS	TRIG	DISP
a	b	c	d	e	1	ON OFF		
0 ERROR	1 108x	2 MULTIPL. ADD	3 PRINT	4 RECOMB	2 USED	0 ☐ ☒	DEG ☒	FIX ☒
5 PARTING	6 STACK DOWN	7 ADD	8 LIFT STACK	9 WRITE OVER	3 NUMBER INPUT	1 ☐ ☒	GRAD ☐	SCI ☐
						2 ☐ ☒	RAD ☐	ENG ☐
						3 ☐ ☒		n 0



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CARD #3

1 (ENTER) $a+b$ CLX $R \downarrow$ $\div$ 2

STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1	LOAD SIDE 1 AND 2			
2	IF YOU HAVE USED THE CALCULATOR FOR SOME OTHER CALCULATIONS (NOT DOUBLE PRECISION) CLEAR MEMORY AND NORMAL STACK		Δ CLREG PZS $\div$ CLREG CLX ENT ENT ENT	0. 0.
3	TO ENTER INTEGERS IN VIRTUAL STACK	a b	ENT A	a 0.
3a	TO ENTER INTEGERS WITH $a \neq 0$ (IF $a = 0$)	b	A	0
4	DO DIVISION	a1 b1	ENT E	PRINT QUOTIENT 0.
5	FOR A NEW DIVISION GOTO STEP 3			
6a	IF YOU WANT TO STORE RESULT IN STORAGE REGISTER I	I	$R \downarrow$ STO I $R \downarrow$	QUOT. I QUOT.
7a	TO CLEAR QUOTIENT		B	0.
7b	TO CLEAR QUOTIENT BEFORE A NEW DATA INPUT	a2 b2	C ENT D	0.
	STEPS 6a, 7a, 7b ARE OPTIONAL			



REGISTERS

0	1	2	3	4	5	6	7	8	9
S0 S	S1 T	S2 O	S3 R	S4 A	S5 G	S6 U	S7 V	S8 W	S9 S
A USED	B USED	C USED	D USED	E USED	F USED	G USED	H USED	I USED	J USED



DIVISION Program Listing II

STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
113	STO7			169	RCL7		
114	7			170	1		
115	STO1			171	0		
116	GSB5		SHIFT PARTIAL REM.	172	X		
117	DSZ1			173	+		
118	GSB5		SHIFT PARTIAL QUOT.	174	STO1		
119	RCLB			175	P2S		
120	120	ST+6		176	F09		
121	RCLC			177	RTH		
122	1			178	RCLC		IF i = 7 (V)
123				179	6		$E_{NEW} = E_{OLD} - 1$
124	STOE			180			
125	X#09		FINISH?	181	5		
126	GT03			182	RCL1		IF i = 6 (V)
127	CF0			183			$E_{NEW} = E_{OLD} + 1$
128	CF1		PRINT "REMAIN-	184	2		
129	P2S		DER"	185	X		
130	RCL7			186	+		
131	X#09			187	STOE		
132	PRTX			188	GT01		
133	SPC		PRINT	189	*LBL6		
134	GSB6		QUOTIENT	190	RCL8		STACK
135	ENG			191	STO7		DOWN
136	DSP9			192	R4		(S) → S
137	RCL6			193	RCL9		(S) → W
138	EEX			194	STO8		(W) → V
139	9			195	R4		
140	140	X		196	P2S		
141	X#09			197	F29		
142	PRTX			198	RTH		
143	P2S			199	SF2		
144	FIX			200	GT06		
145	DSP0			201	*LBL8		STACK
146	RCL6			202	RCL8		LIFT
147	PRTX			203	STO9		
148	SPC			204	R4		
149	0			205	RCL7		
150	150	RTH		206	STO8		
151	*LBL5			207	R4		
152	5		SHIFT LEFT	208	RCL5		
153	RCL1		SUBROUTINE	209	STO7		
154	X=Y?		OF (U) AND	210	R4		
155	GT02		(W)	211	P2S		
156	RCL1			212	F29		
157	EEX			213	GT09		
158	8			214	SF2		
159				215	GT08		
160	160	ENT1		216	*LBL9		NEW (U)
161	FRC			217	STO6		
162	EEX			218	P2S		
163	9			219	R4		
164	X			220	STO6		
165	STO1			221	R4		
166	R4			222	P2S		
167	INT			223	0		
168	P2S			224	RTH		

LABELS						SET STATUS		
A ENTER	B CLX	C R↓	D	E DIVIDE	F CLX MEM.	FLAGS	TRIG	DISP
a	b	c	d	e	1 CARRY	ON OFF		
0 (ERROR)	1 SHIFT	2 DIVISION PREPAR.	3 DIVISION	4	2 USED	0 ☐ ☒	DEG ☒	FIX ☒
5 SHIFT LEFT	6 STACK DOWN	7	8 LIFT STACK	9 WRITE OVER	3 NUMBER INPUT	1 ☐ ☒	GRAD ☐	SCI ☐
						2 ☐ ☒	RAD ☐	ENG ☐
						3 ☐ ☒		n 0