

Program Title NUMBER HUNT

Contributor's Name Yuji Ijiri

Address Carnegie-Mellon University

City Pittsburgh State PA Zip Code 15213

**Program Description, Equations, Variables** This program combines the games of Mastermind (MM) and Supermastermind (SMM) which are commercially sold. A secret code of 4 digits (MM) or 5 digits (SMM) is generated. Each digit in the code ranges from 1 to 6 (MM) or from 1 to 8 (SMM), although the upperbound  $K$  may be altered to any number in the range  $2 \leq K \leq 9$  at user's option.

To break the secret code, a series of trial codes are keyed in. At each trial, two kinds of feedback,  $M$  and  $N$ , are generated.  $M$  is the number of columns with matching digits. Hence, the secret code is broken if  $M = 4$  (MM) or  $M = 5$  (SMM).  $N$  is the number of columns with matching digits when the trial code is optimally rearranged. Hence,  $N - M$  indicates the number of digits that are correct but in a wrong place.

The object of the game is to break the code in the smallest number of trials  $T$ . (The decimal point flashes in the feedback if the code has been broken.) A suggested par is  $T = 6$  for MM and  $T = 8$  for SMM.  $T > 10$  for MM and  $T > 12$  for SMM should be considered failure.

**Operating Limits and Warnings** For HP-97, strike out Line 152 (F3?) so that each output is printed.

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 II

Sketch(es)

**Sample Problem(s)** Turn the calculator off and on. Load Side 1 and Side 2 of the program card. Press **[E]**.\* Try the following sequence of trial codes.

Key in Trial Code	Press	Intermediate Feedback (M) 0.0M00	Final Feedback CCCC.NMTT	Meaning		
				N	M	T
1234	<b>[A]</b>	0.0000	1234.2001	2	0	01
2121	<b>[A]</b>	0.0200	2121.3202	3	2	02
2115	<b>[A]</b>	0.0200	2115.4203	4	2	03
2511	<b>[A]</b>	0.0400	2511.4404	4	4	04

\*6666.0000 which shows up on display upon pressing **[E]** means that the secret code is in the range from 1111 to 6666.

**Solution(s)** Here, M is the number of columns with matching digits and N is the same when the trial code is optimally rearranged. Hence, N - M is the number of digits that are correct but in a wrong place. The code was broken at the fourth trial (T = 04) as indicated by the intermediate feedback 0.0400 (M = 4) and the flashing decimal point in the final feedback 2511.4404. The sequence of final feedback may be reviewed at any time by pressing **[B]**. (To stop, press any key.) Pressing **[C]** displays the secret code as 2511.0000.

Reference(s)

1	NUMBER HUNT CHNG MAX TRIAL    PREV.    TRL    SEC.    CODE    START-5    START-4	2
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STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1	Load side 1 and side 2.		<input type="text"/> <input type="text"/>	
2	Optional: Input K ( $2 \leq K \leq 9$ ), which remains in effect unless canceled by:	K	f C h CF 0	
3	(For the first code only.) Key in any fraction as a random number seed; Then--	.nnn	<input type="text"/> <input type="text"/>	
4	Generate a secret code which is either: a 4-digit code SSSS ( $1 \leq S \leq 6$ or K) or a 5-digit code SSSSS ( $1 \leq S \leq 8$ or K)		E or D	6666.0000 88888.0000 (or K's)
5	Input a trial code, CCCC or CCCCC. TT: The trial number (01, 02, 03, ...) M: No. of columns with matching digits N: No. of columns with matching digits when the trial code is optimally rearranged. Hence, N-M: No. of correct digits that are in wrong places.	CCCCC	A	0.0M00 CCCC.NMTT
6	Optional (at any time): To make a quick review of the output of prior trials. (If last TT > 10, the output is over-written on the earliest output.) To stop the review, press any key. Repeat step 6 as necessary.		B	CCCC.NM01 CCCC.NM02 CCCC.NM03 .....
7	Optional (immediately after step 6). To bring the output at trial TT to the x-register for a longer review. (T* is the last digit of TT - 1.)		RCL T*	CCCC.NMTT
8	Optional (at any time): To display the secret code.		C	SSSS.0000
9	Go to step 4 for a new secret code.			

STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBL C	32 25 13			1	01	
	F2?	35 71 02			1	01	
	P $\frac{2}{2}$ S	31 42			1	01	
	SF 0	35 51 00		060	1	01	
	STO 8	33 08			RCL 8	34 08	
	RTN	35 22			x	71	
	*LBL D	31 25 14			DSP 4	23 04	
	SF 1	35 51 01			RTN	35 22	
	GTO 0	22 00			*LBL A	31 25 11	
010	*LBL E	31 25 15			F2 ?	35 71 02	
	CF 1	35 61 01			P $\frac{2}{2}$ S	31 42	
	*LBL 0	31 25 00			STO 6	33 06	
	F2 ?	35 71 02			EEX	43	
	P $\frac{2}{2}$ S	31 42		070	4	04	
	P $\frac{2}{2}$ S	31 42			$\div$	81	
	CLRG	31 43			2	02	
	P $\frac{2}{2}$ S	31 42			0	00	
	RCL 0	34 00			STO I	35 33	
	+	61			*LBL 3	31 25 03	
020	FRAC	32 83			R $\downarrow$	35 53	
	$\pi$	35 73			INT	31 83	
	+	61			STO (i)	33 24	
	5	05			LST x	35 82	
	y <sup>x</sup>	35 63		080	FRAC	32 83	
	FRAC	32 83			1	01	
	STO 0	33 00			0	00	
	F0 ?	35 71 00			x	71	
	GTO 1	22 01			ISZ	31 34	
	6	06			RCL I	35 34	
030	F1 ?	35 71 01			2	02	
	8	08			5	05	
	STO 8	33 08			-	51	
	*LBL 1	31 25 01			x $\neq$ 0	31 61	
	5	05		090	GTO 3	22 03	
	STO I	35 33			STO I	35 33	
	RCL 0	34 00			RCL 1	34 01	
	*LBL 2	31 25 02			RCL A	34 11	
	RCL 8	34 08			x = y	32 51	
	x	71			ISZ	31 34	
040	FRAC	32 83			RCL 2	34 02	
	LST x	35 82			RCL B	34 12	
	INT	31 83			x = y	32 51	
	1	01			ISZ	31 34	
	+	61		100	RCL 3	34 03	
	STO (i)	33 24			RCL C	34 13	
	R $\downarrow$	35 53			x = y	32 51	
	DSZ	31 33			ISZ	31 34	
	GTO 2	22 02			RCL 4	34 04	
	$\pi$	35 73			RCL D	34 14	
050	F1 ?	35 71 01			x = y	32 51	
	RCL 1	34 01			ISZ	31 34	
	STO 1	33 01			RCL 5	34 05	
	0	00			RCL E	34 15	
	STO 7	33 07		110	x = y	32 51	
	F1 ?	35 71 01			ISZ	31 34	
	1	01			4	04	

## REGISTERS

0	1	2	3	4	5	6	7	8	9
RAND. NO.	CODE 1	CODE 2	CODE 3	CODE 4	CODE 5	OUTPUT	TRIAL #	K=MAX	
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9
TRIAL 1	TRIAL 2	TRIAL 3	TRIAL 4	TRIAL 5	TRIAL 6	TRIAL 7	TRIAL 8	TRIAL 9	TRIAL 10
A	B	C	D	E	I				
TRIAL CODE 1	TRIAL CODE 2	TRIAL CODE 3	TRIAL CODE 4	TRIAL CODE 5	INDEX				

STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
	F1 ?	35 71 01			ISZ	31 34	
	5	05		170	RCL C	34 13	
	RCL I	35 34			x = y	32 51	
	x ≠ y	32 61			GTO 5	22 05	
	CF 3	35 61 03			R ↓	35 53	
	EEX	43			ISZ	31 34	
	2	02			RCL D	34 14	
120	÷	81			x = y	32 51	
	STO+6	33 61 06			GTO 5	22 05	
	PAUSE	35 72			R ↓	35 53	
	RCL 1	34 01			ISZ	31 34	
	GSB 4	31 22 04		180	RCL E	34 15	
	RCL 2	34 02			x = y	32 51	
	GSB 4	31 22 04			GTO 5	22 05	
	RCL 3	34 03			RTN	35 22	
	GSB 4	31 22 04			*LBL 5	31 25 05	
	RCL 4	34 04			0	00	
130	GSB 4	31 22 04			STO (i)	33 24	
	RCL 5	34 05			.	83	
	GSB 4	31 22 04			1	01	
	RCL 7	34 07			STO+6	33 61 06	
	EEX	43		190	RTN	35 22	
	3	03			*LBL C	31 25 13	
	x	71			F2 ?	35 71 02	
	FRAC	32 83			P↔S	31 42	
	1	01			0	00	
	0	00			F1 ?	35 71 01	
140	x	71			RCL 1	34 01	
	STO I	35 33			1	01	
	EEX	43			0	00	
	CHS	42			ENTER	41	
	4	04		200	ENTER	41	
	STO+7	33 61 07			R ↑	35 54	
	RCL 7	34 07			x	71	
	RCL 6	34 06			RCL 2	34 02	
	+	61			+	61	
	P↔S	31 42			x	71	
150	STO (i)	33 24			RCL 3	34 03	
	P↔S	31 42			+	61	
	F3 ?	35 71 03			x	71	
	-x-	31 84			RCL 4	34 04	
	RTN	35 22		210	+	61	
	*LBL 4	31 25 04			x	71	
	2	02			RCL 5	34 05	
	0	00			+	61	
	STO I	35 33			RTN	35 22	
	R ↓	35 53			*LBL B	31 25 12	
160	RCL A	34 11			F2 ?	35 71 02	
	x = y	32 51			P↔S	31 42	
	GTO 5	22 05			SF 2	35 51 02	
	R ↓	35 53			P↔S	31 42	
	ISZ	31 34		220	REG	35 74	
	RCL B	34 12			RTN	35 22	
	x = y	32 51					
	GTO 5	22 05					
	R ↓	35 53					

## LABELS

## FLAGS

## SET STATUS

A TRIAL	B PREV. TR	C SEC. CD	D START-5	E START-4	F MAX CH'D	FLAGS	TRIG	DISP
a	b	c CHNG MAX	d	e	f START-5	ON OFF		
0 USED	1 USED	2 USED	3 USED	4 USED	2 PS USED	0 <input type="checkbox"/> <input checked="" type="checkbox"/>	DEG <input checked="" type="checkbox"/>	FIX <input checked="" type="checkbox"/>
5 USED	6	7	8	9	3 BROKEN	1 <input type="checkbox"/> <input checked="" type="checkbox"/>	GRAD <input type="checkbox"/>	SCI <input type="checkbox"/>
						2 <input type="checkbox"/> <input checked="" type="checkbox"/>	RAD <input type="checkbox"/>	ENG <input type="checkbox"/>
						3 <input type="checkbox"/> <input checked="" type="checkbox"/>		n <u>4</u>