

## software feature.

### MATCH THIS

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TRY TO MEMORIZE KIM's RANDOM TONE/LIGHT PATTERN-  
"BONUS" POINTS ARE GIVEN FOR REACHING "MILESTONES".  
AN INTERACTIVE GAME FOR A "NAKED" KIM-1.

This game requires a speaker/amplifier connection to the KIM-1 Application connector PA0 port as shown on page 57 of the KIM-1 Users's Manual.

The game initializes page 0 locations by itself, and uses page 0 as a storage register for the game's moves. The program starts from "GO" at 0200 Hex, and occupies memory through 036D Hex.

When the "GO" button is pressed at 0200, a randomly chosen number (either a "0", "1", "2" or "3"), will appear in the KIM-1 display. The number will be positioned corresponding to the bottom four (0,1,2,3) keys of the KIM keyboard. A tone related to the number displayed will come from the speaker.

The tone/character will appear briefly and stop-KIM awaits your response. Hit the key that matches the displayed character. If you hit the correct key, the same tone/number will be generated. The display will then light showing "b6C0 00", and the right digit will increment to display "b6C0 01" as you watch-this indicates that you've matched one step so far. KIM will now go back and play the first character, and then will add another at random-it may be the same as the preceding one-just play the keys as KIM directs.

### "MATCH THIS"

#### PROGRAM LISTING FOR KIM-1

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LABEL	ADDRESS		DATA FIELD			OPCODE	FUNCTION	DESCRIPTION
	A1	A2	D1	D2	D3			
START	02	00	D8			CLD	CLEAR DECIMAL MODE.	
	01	A2	07			LDA#	NO. OF WORDS TO MOVE	INITIALIZE PAGE
MOVE	02	03	BD	55	03	LDAabs+X	FROM INITIAL DATA TO	ZERO FIELDS.
	06		95	D5		STAZ+X	PAGE 0 FIELD STARTING WITH D5.	
	08		CA			DEX	NEXT ITEM TO MOVE.	
	09		10	F8		BPL	to MOVE UNTIL DONE.	
	0B		AD	04	17	LDAabs	from TIMER (KIM'S + 1) for RANDOM NUMBER.	
	0E		29	03		AND#	AND with 03 to MASK (STRIP to 0-3).	
	02	10	85	00		STAZ	Put RANDOM NUMBER in 0000. (First move).	
	02	12	20	4A	03	JSR	"DELAY" Wait 1/2 second.	
	02	15	20	0E	03	JSR	"SOUNDS" Play tone/light display once.	
	02	18	A5	DC		LDA#	check MODE reg for 1="TEST", 0="PLAY".	
PLAY1 PLAY2	1A		D0	16		BNE	to "TEST2" if MODE="TEST".	
	1C		A5	D6		LDA#	get SEQUENCE COUNTER value.	
	12		C5	D7		CMPE	compare to STEP COUNTER value, and go	
	02	20	F0	0C		BEQ	to "TEST1" if equal.	
	22		B6	D6		INC#	increment SEQUENCE COUNTER for next move.	
	24		A9	00		LDA#	zero MODE to "PLAY" mode.	
	26		85	DC		STAZ	so "PLAY" can continue.	
	28		20	4A	03	JSR	"DELAY" Wait 1/2 second.	
	2B		38			SEC	set carry for "branch always"	
	02	2C	B0	E7		BCS	to "PLAY1", to continue.	
TEST1	02	2E	A9	00		LDA#	zero SEQUENCE COUNTER to	
	02	30	85	D6		STAZ	begin "TEST".	
TEST2	02	32	A9	01		LDA#	set MODE to "TEST". ("TEST" = 1)	
	34		85	DC		STAZ	store "1" in MODE.	
KEYIN	02	36	A9	00		LDA#	ready and clear DDR (Data Direction Register)	
	38		8D	41	17	STAabs	for safe "GETKEY" usage.	
	3B		AD	04	17	LDAabs	from KIM TIMER + 1 for RANDOM NUMBER and	
	3E		29	03		AND#	AND with 03 to MASK (STRIP to 0-3)	
	02	40	85	DD		STAZ	store in RANDOM NUMBER for future use.	
	42		20	6A	1F	JSR	"GETKEY" KIM subroutine- what key is pressed?	
	45		C9	15		CMPE	if it's 15, it's NO KEY PRESSED, so it's back	

When you successfully complete a sequence, the display will show the score you've reached. If you should strike an incorrect key during the sequence, KIM will immediately show an "E" at the display's left and sound a low "BUZZ" through the loudspeaker--the "Bonus Counter" score at the left (next to the "b") will be decremented by one--this means you have one less chance to continue the game (you started with 6 chances), and KIM will then go back to the beginning and replay the sequence to the point you had reached (your highest score at this point) before you made an error. KIM will now wait for your response to continue the game. The program will wait forever at this point--so there's no rush to go on. You may even press "GO" at this point to give up the whole game and restart from scratch if you like.

Continue play as KIM dictates, and you'll eventually repeat up to 6, 15 or 25 tone sequences. These values are "Bonus Milestones" and you will get 1 extra "Bonus Point" in the Bonus Register for reaching each of these scores. A Bonus point represents one extra chance to continue the game for your highest score.

Should you make too many errors, the Bonus Counter will run out of chances. Just as the last "1" disappears from the Bonus display, an "L" will appear in the middle of the display, and you'll hear a low "raspberry" BUZZ tone from the speaker--this will alternate with a display of the highest score you reached before losing. KIM will keep buzzing and flashing like this forever (ignoring all other keypresses) until you press the "GO" button for a moment--this will restart the game from the very start--from scratch ("b6C0 00").

This game has no upper limit, although its score counter will roll over from 99 to 00 points, data will still be added to page zero memory. However, I don't believe anyone will have problems caused by getting that far. (The first person who does, can write a patch to add the "1" in front of the 001)

GOOD LUCK!!

	47	F0 ED	BEQ	to "KEYIN" until a key is pressed.
	49	C9 13	CMF#	if it's 13, it's the GO key, so if it is- go
	4B	F0 B3	BEQ	to "START"-someone didn't like the game so far.
	4D	A6 D6	LDX#	get SEQUENCE COUNTER value for next instruction.
	4F	D5 00	CMF#X	is the right key pressed? (0,1,2 or 3?), then go
	02 51	F0 33	BEQ	to "INCREMENT" to up the score.
	53	18	CLC	clear carry for illegal key check- if key value
	54	69 FC	ADC#	is added to FC, it'll cause a CARRY if over 3
	02 56	B0 DE	BCS	to "KEYIN" 'cause we'll ignore keys over 3.
				FALL THROUGH to "ERROR" if all above conditions
				are not met-therefore it must be the wrong key.
<u>ERROR</u>	02 58	A9 00	LDA#	zero LOOP STATUS for first pass showing
	5A	85 DE	STAZ	bonus and score counters before loss of point.
	5C	A9 F9	LDA#	"E" character for display.
	5E	8D 40 17	STAabs	put in CHARACTER (PBD register).
	02 61	A9 09	LDA#	"E" will show up in leftmost position.
	63	8D 42 17	STAabs	put in POSITION register.
	66	A0 04	LDY#	"ERROR" tone value for "TONE" subroutine.
	68	20 1E 03	JSR	"TONE" - Sound "ERROR" tone- LOW "BUZZ".
<u>SHOWLOSS</u>	68	20 F4 02	JSR	"SCORDIS" - Show bonus and score values.
	6E	A5 DE	LDA#	check LOOP STATUS to repeat or exit-
	02 70	D0 08	BNE	to ERREND to exit if second pass finished.
	72	C6 D5	DEC#	decrement BONUS COUNTER 'cause you goofed!
	74	F0 62	BEQ	BONUS now "0"? too bad-go to "LOSE" subroutine.
	76	E6 DE	INC#	LOOP STATUS to "1"-don't decrement any more.
	78	D0 F1	BNE	to SHOWLOSS to display decremented bonus.
<u>ERREND</u>	7A	20 4A 03	JSR	"DELAY" wait 1/2 second.
	7D	A9 00	LDA#	zero for:
	7F	85 D6	STAZ	SEQUENCE COUNTER to start play from beginning.
	02 81	85 DC	STAZ	MODE to "PLAY" for repeat of sequence.
	02 83	4C 15 02	JMP	"PLAY1" to remind you of sequence.
<u>INCREMENT</u>	02 86	20 0E 03	JSR	"SOUNDIS" -play for valid keypress.
<u>KEYDOWN</u>	89	20 40 1F	JSR	"KEYDOWN" KIM subroutine-wait for key release
	8C	D0 FB	BNE	to KEYDOWN until key is released-avoid errors.
	8E	A5 D7	LDA#	get STEP COUNTER value (highest step reached)
	02 90	C5 D6	CMF#	equal to SEQUENCE COUNTER? then go on
	92	F0 05	BEQ	to INCEND- (don't play any more-show score).
	94	E6 D6	INC#	well then, go on playing.
	96	4C 18 02	JMP	"PLAY2" to continue (but not from 0).
<u>INCEND</u>	99	E6 D7	INC#	increment STEP COUNTER to record progress.
	9B	A9 00	LDA#	zero LOOP STATUS for first score display
	9D	85 DE	STAZ	to show increment of score in DECIMAL.
	9F	20 F4 02	JSR	"SCORDIS" to show bonus and score.
	02 A2	A5 DE	LDA#	check LOOP STATUS if one INCREMENT was done.
	A4	D0 10	BNE	to ONWARDS if it was, otherwise,
	A6	F8	SED	set DECIMAL mode for decimal score increment.
	A7	18	CLC	clear carry so decimal mode adds properly.
	A8	A9 01	LDA#	start with "01" in accumulator, and
	AA	65 D8	ADC#	add this to score in DECIMAL SCORE COUNTER (in acc)
	AC	85 D8	STAZ	put result into DECIMAL SCORE COUNTER, and
	AE	D8	CLD	we've now finished a decimal increment.
	AF	A9 01	LDA#	make LOOP STATUS "1" so increment is not
	02 B1	85 DE	STAZ	repeated again this time.
	B3	20 F4 02	JSR	"SCORDIS" to show bonus,score.
<u>ONWARDS</u>	02 B6	A2 02	LDX#	ready to test for 3 BONUS MILESTONES
<u>BONUCHEK</u>	B8	B5 D9	LDA#X	start by checking DB, then DA, D9-
	BA	C5 D8	CMF#	does DECIMAL SCORE COUNTER equal any of these?
	BC	F0 05	BEQ	to BONUMET if one matches, continue checking
	BE	CA	DEX	by trying against next BONUS MILESTONE.
	BF	10 F7	BPL	to BONUCHEK if all milestones aren't tested.
	02 C1	30 06	BMI	to EXITINC since all milestones are tested.
<u>BONUMET</u>	C3	A9 FF	LDA#	if a milestone is reached, make it impos-
	C5	95 D9	STAZ+X	sible to match again this game.
	C7	E6 D5	INC#	increment BONUS COUNTER for MILESTONE was met.
<u>EXITINC</u>	C9	A6 D7	LDX#	ready to store RANDOM NUMBER in its new spot.
	CB	A5 DD	LDA#	get RANDOM NUMBER that was generated before,
	CD	95 00	STAZ+X	and store in new page zero location.
	CF	A9 00	LDA#	ready to go back to play mode to continue.
	02 D1	85 DC	STAZ	MODE to "PLAY" (MODE=0)
	D3	85 D6	STAZ	SEQUENCE COUNTER to "0" to play from beginning.
	02 D5	4C 15 02	JMP	"PLAY1" Play the stored sequence from pg. 0.
<u>LOSE</u>	02 D8	A9 B8	LDA#	"L" character for "LOSE" display.
	DA	8D 40 17	STAabs	in CHARACTER register.
	DD	A9 0F	LDA#	fourth position in display.
	DF	8D 42 17	STAabs	in POSITION register.
	02 E2	A0 05	LDY#	"LOSE" tone value (Low BUZZ).
	E4	20 1E 03	JSR	"TONE" - sound for loss.
	E7	20 F4 02	JSR	"SCORDIS" - show score reached before loss.
	EA	20 6A 1F	JSR	"GETKEY" (KIM subroutine) only way out of this-
	ED	C9 13	CMF#	if key is "GO" key-we'll start over again,
	EF	D0 E7	BNE	to LOSE, to stay for good otherwise.
	02 F1	4C 00 02	JMP	to START to begin from scratch.

SCORDIS	02 F4	A5 D5	LDA#	get BONUS COUNTER value for display.
	F6	09 B0	ORA	put a "B" in front of value (could be 1-9).
	F8	85 FB	STA#	put "Bx" in SCANDS page zero register-(LEFT).
	FA	A9 C0	LDA#	"C0" for center display for COUNT.
	FC	85 FA	STA#	put in SCANDS page zero register-(CENTER).
	FE	A5 D8	LDA#	get value of DECIMAL SCORE COUNTER.
	03 00	85 F9	STA#	put in SCANDS page zero register-(RIGHT)
	02	A9 FF	LDA#	starting value for SCANDS counter.
	04	85 D3	STA#	load SCANDS counter for display time.
	SCANDS	06	20 1F 1F	JSR
09		C6 D3	DEC#	decrement SCANDS counter (display time).
0B		D0 F9	BNE	to SCANDS if display time not up yet.
03 0D		60	RTS	return from SCORDIS subroutine.
SOUNDIS	03 0E	A6 D6	LDA#	get SEQUENCE COUNTER VALUE-where are we?
	03 10	B4 00	LDY#X	get data for this routine from page zero.
	12	B9 E7 1F	LDAabs+Y	convert data to character using KIM rom table.
	15	8D 40 17	STAabs	store data in CHARACTER (char= "0","1","2", or "3")
	18	B9 5D 03	LDAabs+Y	use Y offset in table to find POSITION.
TONE	1B	8D 42 17	STAabs	in 1742-POSITION register for display.
	03 1E	BE 67 03	LXabs+Y	get TONE TIME for this item from lookup table.
	03 21	86 D4	STX#	put this value in page zero counter.
	23	A9 7F	LDA#	ready to open port of B Data Direction Register.
	25	8D 41 17	STAabs	open port for display of character.
	28	A9 01	LDA#	initial data for PA0 port for speaker.
	03 2A	8D 01 17	STAabs	open PA0 port for speaker.
	2D	8D 00 17	STAabs	send data out to speaker, "on" or "off".
REPEAT	03 30	BE 61 03	LDXabs+Y	get TONE data from lookup table.
	33	8E 06 17	STXabs	start KIM timer (+ 64) (how long on or off).
BIT1	36	2C 07 17	BITabs	time up yet?
	39	10 FB	RPL	to BIT1 if not done, otherwise go on to
	3B	49 01	EOR	exclusive OR accum. with 01 to flip spkr. bit.
	3D	C6 D4	DEC#	decrement TONE TIME register.
	3F	D0 EC	BNE	to REPEAT to send flipped bit to speaker.
	03 41	A9 00	LDA#	zero so as to end SOUNDIS routine by
	43	8D 01 17	STAabs	closing the speaker port, (no DC to speaker),
	46	8D 40 17	STAabs	and closing the display port.
	03 49	60	RTS	SOUNDIS done-back to where you came from.
	DELAY	03 4A	A9 FF	LDA#
4C		8D 07 17	STAabs	start KIM timer (+ 1024).
BIT2	4F	2C 07 17	BITabs	check for time up.
	03 52	10 FB	RPL	done? back if not, otherwise go on. (back to BIT2)
	03 54	60	RTS	back to where you came from.
	<u>INITIAL DATA FIELD FOR START ROUTINE</u>			
	03 55	06	DATA 1	BONUS COUNTER starting value for 00D5.
	56	00	DATA 2	SEQUENCE COUNTER starts at "00"-for 00D6.
	57	00	DATA 3	STEP COUNTER starts at "00"-for 00D7.
	58	00	DATA 4	DECIMAL SCORE COUNTER to "00" for 00D8.
	59	06	DATA 5	MILESTONE 1-Get past "06" and get a BONUS POINT.
	5A	15	DATA 6	MILESTONE 2-Pass "15" and get another point.(DA)
	5B	25	DATA 7	MILESTONE 3-Pass "25" and get yet another.(00DB)
	03 5C	00	DATA 8	MODE starts in "PLAY" ("00") mode.(00DC)
<u>LOOKUP TABLE VALUES FOR "SOUNDIS" ROUTINE</u>				
POS DATA	03 5D	09	DATA 9	FIRST (leftmost) character position in display.
	5E	0B	DATA 10	SECOND character position.
	5F	0D	DATA 11	THIRD character position.
	03 60	0F	DATA 12	FOURTH character position.
TONE DATA	03 61	88	DATA 13	(62 Hz) TONE for character "0".
	62	35	DATA 14	(150 Hz) TONE for character "1".
	63	18	DATA 15	(325 Hz) TONE for character "2".
	64	11	DATA 16	(448 Hz) TONE for character "3".
	65	B0	DATA 17	"ERROR" TONE for "E" character.
TIME DATA	66	00	DATA 18	"LOSE" TONE for "L" character.
	03 67	20	DATA 19	(230 ms) TIME value for "0" tone.
	68	50	DATA 20	(230 ms) TIME value for "1" tone.
	69	B0	DATA 21	(230 ms) TIME value for "2" tone.
	6A	FF	DATA 22	(230 ms) TIME value for "3" tone.
	6B	80	DATA 23	"ERROR" tone time-3 seconds.
	6C	55	DATA 24	"LOSE" tone time-2 seconds.
	03 6D	-----LAST ADDRESS-----		

OPCODE SYMBOL REMINDER: #= IMMEDIATE ADDRESSING MODE.  
 #= ZERO PAGE ADDRESSING MODE.  
 abs= ABSOLUTE ADDRESSING MODE.  
 +Y,+X= MODE INDEXED BY X OR Y REGISTERS.