Program Description I

Program Title Hunt the Wumpus

Contributor's Name Damon C. Temple
Address 4009 Beechwood Rd.
City Hyattsville **State** Md. **Zip Code** 20782

Program Description, Equations, Variables

Wumpus is based on the game by that name which appeared in Sept-Oct 1975 issue and the Jan-Feb 1976 issue of "Creative Computing." The Wumpus is an imaginary cave dwelling creature, and your objective is to find and kill the creature with one of your five arrows. To do this, you must make your way through a series of caves that are connected by tunnels. Each cave has three tunnels leading from it. Some of these tunnels may be one-way, others may be two-way, and occasionally, a tunnel may loop back to the cave from which it started.

There are dangers in the caves: two caves contain bottomless pits. If you should wander into either of these caves, you fall into the pits and the game is over. Two more caves contain "superbats." When you enter a bat cave, these superbats carry you off and randomly drop you into another cave. If that cave contains the pits, the game is over. Still another danger is that you may wander into the cave containing the Wumpus itself (or maybe the bats will drop you there) at an inopportune time. Whenever you and the Wumpus are in the

Operating Limits and Warnings There must always be exactly 15 caves, and each cave must have three tunnels leaving it, one of which should exit to a different cave. Occassionally, access to the Wumpus may be completely blocked by bats and pits. You will have to find a way to force the Wumpus to move if this happens, else you will wander the caves forever.

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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same cave, one of three things will happen: 1) the Wumpus will be sleeping and so ignore you, 2) the Wumpus will be startled out of his slumber and run to another cave (randomly), or 3) the Wumpus will get mad, attack, and have you for dinner.

As you travel the tunnels from cave to cave, you are given hints as to what lies beyond the cave you are currently in. These hints are in the form of a three digit fraction. Possible outputs are:

I.000 - nothing in adjacent caves
I.001 - bats in at least one of the adjacent caves
I.010 - pits in at least one of the adjacent caves
I.011 - pits and bats in at least one adjacent cave
I.100 - wumpus is in one of the adjacent caves
I.101 - wumpus and bats in one or more adjacent caves
I.110 - wumpus and pits in one or more adjacent caves
I.111 - wumpus, pits, and bats in one or more adjacent caves

"I" is the number of arrows you have left (1 to 5). Following this warning code, your current cave number and the caves to which it connects are output. Example: 12.071114 would indicate that you are currently in cave number 12 and that tunnels lead from that cave to caves 7, 11, and 14.

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Program Description, Equations, Variables

When you think you have found the Wumpus, you shoot an arrow into his cave. You can only shoot into an adjacent cave; an attempt to shoot into a non-adjacent cave will cost you one arrow as a penalty and an "error" will be displayed. If you shoot into the correct cave, the Wumpus is destroyed (indicated by flashing the tunnel number repeatedly). If you shoot into the wrong cave, theWumpus will randomly relocate to another cave and you will have to start your search all over again. When all your arrows are gone (indicated by a flashing "99"), you loose.

Initialization of this program: There are two ways to initialize this game. Both start by inputting a random seed between 0 and 1. Then a selection of initialization type is made. Pressing "B" will cause the program to randomize the cave and tunnels. Editing is done to ensure that each cave has three tunnels, that each has at least on entry point, and that each cave has at least one exit point. This randomization takes about 2½ minutes.

Pressing "C" will tell the program that you want to define your own cave structure. You will be prompted for the tunnel connections for each cave, beginning with cave number one and continuing thru cave 15. For each cave, enter either the cave number followed by the tunnels in fractional form (ie when prompted with a 1 enter 1.010712 to indicate that tunnels run to caves 1, 7, and 12) or just the fractional portion (.010712). After the 15th cave is defined, the program will randomly distribute the

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bats, pits, wumpus, and your current position within the structure you have defined. The player will always be in a "safe" cave at the beginning of the game, but will not be given hints about the status of the adjacent caves (1st move, you're on your own). The Wumpus, bats and pits can all co-exist together--bats because they hang from the ceiling, and the wumpus because he has sucker feet that prevent his falling into the pits.

Note: for fast game start-up, record a set of caves on a card for ready use. Then after loading the card, press "E" to place the hazards.

During the course of play, one of the following codes may be flashed:

0. - you fell into a bottomless pit
3. - bats got you/you are relocated at random
88. - wumpus got you and "ate" you for dinner
99. - no more arrows left
n. - where "n" is a cave number you just shot an arrow into, Wumpus is killed

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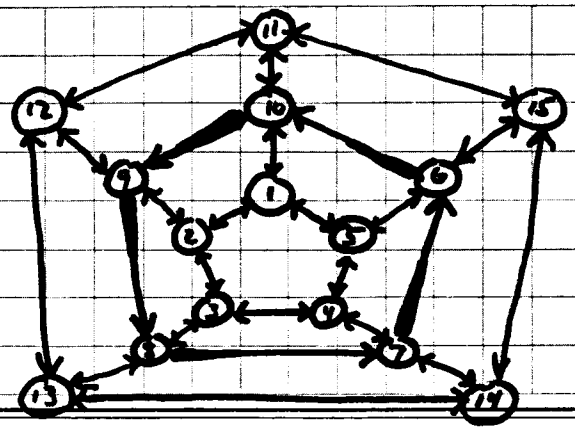
Program Description 11

Sketch(es)



Sample Problem(s) Randomize the cave structure:

1) load both sides of card one and enter a random seed - .314159265 and press "A"

2) press "B" - the pgm will take 2½ minutes to randomize

3) output after initialization is 13.050614 indicating that the player is located in cave number 13 and that tunnels lead to caves 5, 6, and 14.

Define your own caves:

1) enter a seed - .2718349 followed by "A"

2) press "C" - when prompted, key the following

output	input	output	input	output	input
1	.020510	6	.051015	11	.101215
2	.010309	7	.040614	12	.091113
3	.020408	8	.030713	13	.081214
4	.030507	9	.020812	14	.071315
5	.010406	10	.010911	15	.061114

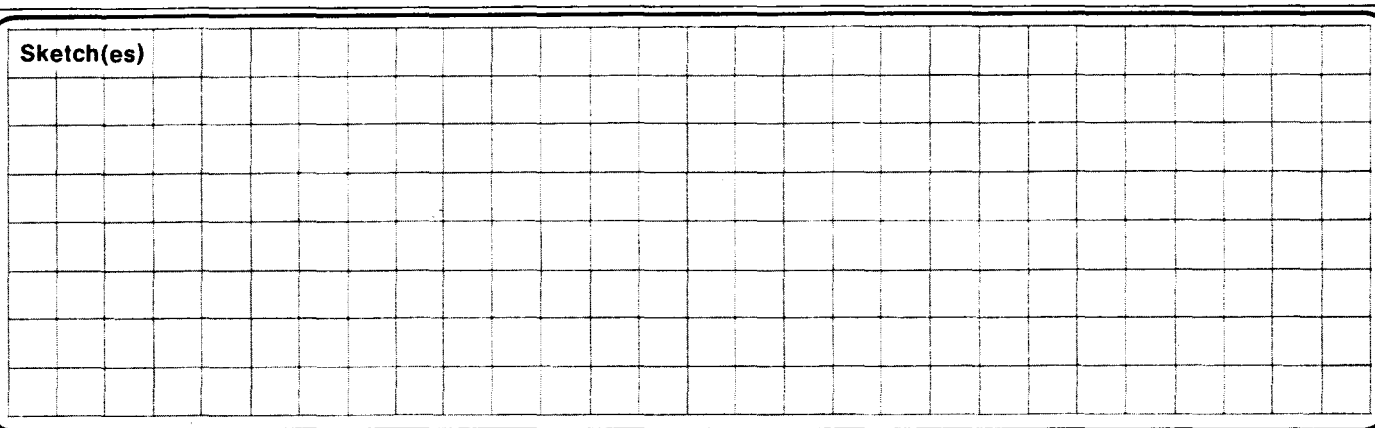
Solution(s)

Each of the above inputs is followed by R/S to enter the data. Final output of user defined structure is 5.010406 indicating that player is in cave 5 and tunnels lead to caves 1, 4, and 6. The above input produces a cave structure as shown above. If you now record the data registers, this structure can be loaded and played at any time by pressing "E" to relocate the hazards.

Reference(s)

Program Description II

Sketch(es)



Sample Problem(s) To play the user-defined structure above:

input	output	
	5.010406	current position
1 "E"	88	flashing/wumpus ate you

to see other possible moves store 5 in RA then

4 "E"	5.010	5 arrows left/pits nearby
	4.030507	tunnels from cave 4 to caves 3,5,7
3 "E"	5.011	pits and bats nearby
	3.020408	
2 "E"	0.	fell into the pits/game over

to see other possible moves, store 3 in RA and continue:

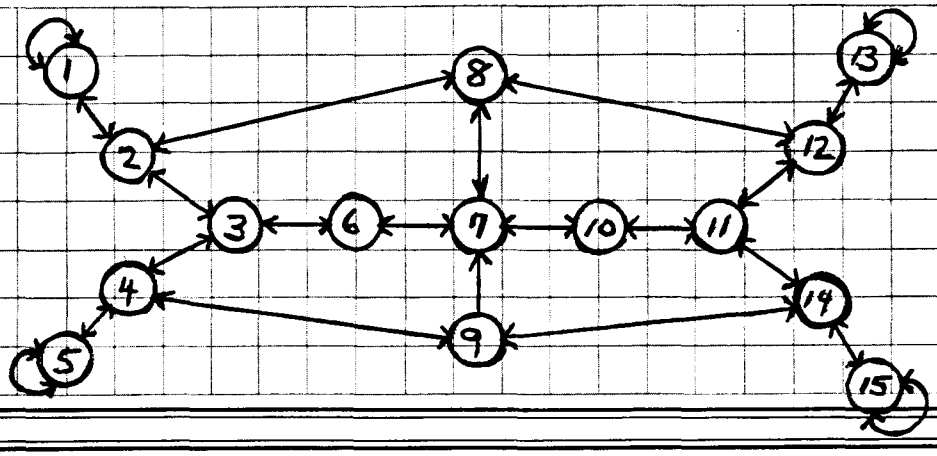
8 "E"	5.010		15 "E"	5.001
	8.030713			15.061114
13 "E"	5.000		6 "E"	3. bats got you/you
	13.081214			are relocated
12 "E"	5.000			5.000
	12.091113			11.101215
11 "E"	5.000		10 "E"	5.100 wumpus nearby
	11.101215			10.010911
			1 "A"	1. flashing/wumpus
				killed

Solution(s)

Reference(s)

Program Description II

Sketch(es)



HERE'S ANOTHER STRUCTURE YOU CAN DEFINE. THE POSSIBILITIES ARE ENDLESS.

Sample Problem(s)

If at any time you attempt to move or shoot into a cave not adjacent to the one you are in, an "error" is displayed. You can press "C" twice to recover from the error and display your current flags and position. Should you fall into a pit on the first move, this key can be used to recover from that situation as well. However, your flags will be meaningless and your position is the pit cave.

To start a new game, reload the initialization card and press "E" to place the hazards in the existing structure. Then reload the game card.

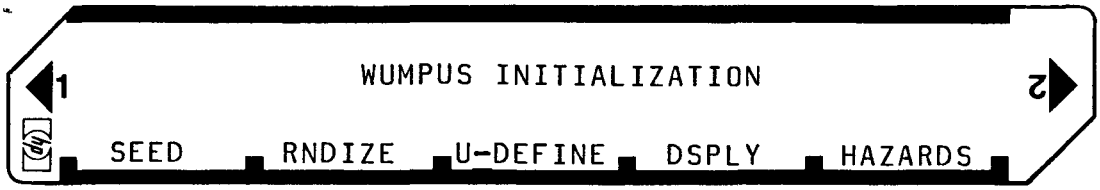
At the end of each session, re-record the standard caves to capture the changing random number seed for use next time.

Solution(s)

HAPPY HUNTING!

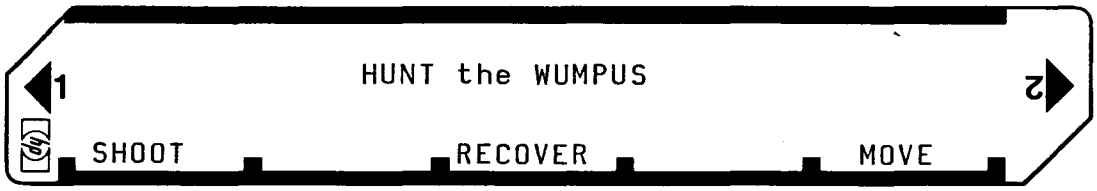
Reference(s)

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1	load both sides of card			
2	if using pre-defined caves		E	C.tttttt
	go to step 5			
3	to randomize a cave structure	seed *	A	seed
			B	C.tttttt
	go to step 5			
4	to define your own structure	seed *	A	seed
	a) tell pgm you are defineing		C	1.
	b) input tunnels	.tttttt	R/S	n+1
	c) repeat 4b until all 15 are done			
	d) final output after cave 15			c.tttttt
5	Optional: to display caves		D	C.tttttt
*	any number between 0 and 1, else a default number is used			

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
6	load both sides of card			C.tttttt
7	to move to a new cave	cave #	E	
	if illegal move			error
	if you fall into a pit			0.
	if the Wumpus ate you			88.
	if the bats got you			3.
	if a legal move			I.nnn
				C.tttttt
8	to shoot an arrow	cave #	A	
	if you killed the Wumpus			cave #
	if illegal cave number			error
	if you missed and no more arrows			99.
	if you missed and have arrow left			I.nnn
				C.tttttt
9	to recover from an "error"		C	your input
			C	I.nnn
				C.tttttt
10	if game not over, go to step 7			
11	to start a new game, go to step 1			

Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*lbl A	31 25 11	Edit and save
002	ABS	35 64	the random seed
003	frac	32 83	
004	X = 0	31 51	
005	Pi	35 73	
006	STO 0	33 00	
007	RTN	35 22	- - - - - - - - -
008	*lbl B	31 25 12	randomize cave
009	rcl 0	34 00	structure
010	clreg	31 43	
011	P⇄S	31 42	
012	clreg	31 43	
013	sto 0	33 00	
014	1	01	
015	5	05	
016	ST I	35 33	set loop cntrl
017	sto E	33 15	
018	*lbl a	32 25 11	gen cave connect.
019	GSB 0	31 22 00	get tunnel
020	GSB 9	31 22 09	verify entry cnt
021	EEX	43	
022	2	02	
023	+	81	
024	STO+(i)	33 61 24	
025	GSB 0	31 22 00	get 2nd tunnel
026	GSB 9	31 22 09	
027	EEX	43	
028	4	04	
029	+	81	
030	STO+(i)	33 61 24	
031	GSB 0	31 22 00	get 3rd tunnel
032	GSB 9	31 22 09	
033	EEX	43	
034	6	06	
035	+	81	
036	STO+(i)	33 61 24	
037	DSZ	31 33	repeat til caves
038	GTO a	22 31 11	are all done
039	1	01	- - - - - - - - -
040	5	05	
041	ST I	35 33	
042	*lbl b	32 25 12	drop entry cnt
043	RCL(i)	34 24	from tunnels and
044	frac	32 83	substitute cave
045	RC I	35 34	number in its
046	+	61	place
047	STO(i)	33 24	
048	DSZ	31 33	
049	GTO b	22 31 12	
050	P⇄S	31 42	- - - - - - - - -
051	*lbl E	31 25 15	get arrow cnt
052	5	05	and locate
053	STO 8	33 08	hazards
054	P⇄S	31 42	
055	GSB 0	31 22 00	get wumpus
056	STO B	33 12	
057	GSB 0	31 22 00	get bat cave 1
058	STO C	33 13	
059	GSB 0	31 22 00	get bat cave 2
060	STO D	33 14	
061	GSB 0	31 22 00	get pit 1
062	STO E	33 15	
063	GSB 0	31 22 00	get pit 2
064	EEX	43	and append to
065	2	02	pit 1
066	+	81	
067	RCL E	34 15	
068	+	61	
069	STO E	33 15	
070	*lbl d	32 25 14	- - - - - - - - - get player loc.
071	GSB 0	31 22 00	and make it safe
072	STO A	33 11	
073	RCL B	34 12	
074	X=Y	32 51	if = wumpus loc
075	GTO d	22 31 14	try again
076	RCL A	34 11	
077	RCL C	34 13	
078	X=Y	32 51	if = batl loc
079	GTO d	22 31 14	try again
080	RCL D	34 14	
081	RCL A	34 11	
082	X≠Y	32 51	if ≠ bat2 loc
083	GTO d	22 31 14	try again
084	RCL E	34 15	
085	int	31 83	
086	X=Y	32 51	if = pitl
087	GTO d	22 31 14	try again
088	RCL E	34 15	
089	frac	32 83	
090	EEX	43	
091	2	02	
092	X	71	
093	RCL A	34 11	
094	X=Y	32 51	if = pit2
095	GTO d	22 31 14	try again
096	ST I	35 33	- - - - - - - - -
097	RCL(i)	34 24	display player
098	DSP 6	23 06	location
099	P⇄S	31 42	
100	RTN	35 22	stop initial.
101	*lbl 9	31 25 09	- - - - - - - - -
102	STO C	33 13	verify cave has
103	X⇄I	35 24	no more than 3
104	STO D	33 14	entry caves
105	RC I	35 34	
106	2	02	
107	.	83	
108	9	09	
109	RCL(i)	34 24	if fewer that 3
110	X ≤ Y	32 71	entry tunnels
111	GTO 1	22 01	use the tunnel
112	*lbl e	32 25 15	else get last

REGISTERS

0 cave10	1 cave 11	2 cave 12	3 cave 13	4 cave 14	5 cave15	6	7	8 arrows	9
S0 seed	S1 cave 1	S2 cave 2	S3 cave 3	S4 cave 4	S5 cave 5	S6 cave 6	S7 cave 7	S8 cave 8	S9 cave 9
A player loc	B wumpus loc	C bats 1	D bats 2	E pits1/2	I used				

Program Listing II

STEP	KEY ENTRY	KEY CODE	COMMENTS
113	RCL E	34 15	cave checked for
114	ST I	35 33	max entries. If
115	2	02	it has fewer than
116	.	83	3 entries, use it
117	9	09	as the reqd
118	RCL(i)	34 24	tunnel
119	X≤Y	32 71	
120	GTO 2	22 02	
121	RCL E	34 15	else subt 1 from
122	1	01	it and try that
123	-	51	tunnel
124	STO E	33 15	
125	GTO e	22 31 15	
126	*lbl 2	31 25 02	get default cave
127	RC I	35 34	and save it as
128	STO C	33 13	entry cave #
129	*lbl 1	31 25 01	
130	1	01	add 1 to number
131	STO+(i)	33 61 24	of cave entries
132	RCL D	34 14	
133	ST I	35 33	restore curr
134	RCL C	34 13	index to cave #
135	RTN	35 22	and return
136	*lbl 0	31 25 00	- - - - - - - - -
137	RCL 0	34 00	rnd number gen
138	9	09	gets numbers
139	9	09	between 1 and 15
140	7	07	
141	X	71	
142	frac	32 83	
143	STO 0	33 00	
144	1	01	
145	5	05	
146	X	71	
147	1	01	
148	+	61	
149	int	31 83	
150	RTN	35 22	- - - - - - - - -
151	*lbl C	31 25 13	user defining
152	DSP 0	23 00	his own caves
153	RCL 0	34 00	
154	clreg	31 43	
155	P≠S	31 42	
156	clreg	31 43	
157	STO 0	33 00	
158	*lbl c	32 25 13	
159	1	01	
160	5	05	
161	ISZ	31 34	add 1 to tunnel
162	RC I	35 34	count
163	X>Y	32 81	if done
164	GTO 1	22 01	jump else hold
165	R/S	84	for input
166	frac	32 83	take only tunnel
167	RC I	35 34	part and add
168	+	61	cave number
169	STO(i)	33 24	set cave up
170	GTO c	22 31 13	go get next cave
171	*lbl 1	31 25 01	- - - - - - - - -
172	P≠S	31 42	Go
173	GTO E	22 15	get hazards
174	*lbl D	31 25 14	- - - - - - - - -
175	0	00	display caves
176	ST I	35 33	
177	P≠S	31 42	
178	*lbl 4	31 25 04	
179	ISZ	31 34	
180	1	01	
181	6	06	
182	RC I	35 34	
183	X=Y	32 51	
184	GTO 5	22 05	
185	RCL(i)	34 24	
186	-X-	31 84	
187	GTO 4	22 04	- - - - - - - - -
188	*lbl 5	31 25 05	
189	RCL A	34 11	display player
190	ST I	35 33	location
191	RCL(i)	34 24	
192	P≠S	31 42	
193	RTN	35 22	stop
194	R/S		
200			
210			
220			

LABELS					FLAGS
A seed	B rndize	C u-define	D display	E hazards	0
a used	b used	c used	d used	e used	1
0 rnd #	1 used	2 used	3	4 used	2
5 used	6	7	8	9 verify	3

SET STATUS

FLAGS			TRIG	DISP	
	ON	OFF			
0	☐	☐	DEG ☐	FIX ☒	
1	☐	☐	GRAD ☐	SCI ☐	
2	☐	☐	RAD ☐	ENG ☐	
3	☐	☐		n 6	

Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*lbl E	31 25 15	move to new cave
002	GSB 5	31 22 05	verify legal mov
003	STO A	33 11	
004	0	00	initialize
005	STO 9	33 09	result code
006	*lbl 4	31 25 04	did player go
007	RCL A	34 11	into wumpus cave
008	RCL B	34 12	
009	X≠Y	32 61	
010	GTO 2	22 02	no
011	SF 2	35 51 02	
012	GSB 8	31 22 08	
013	.	83	did wumpus eat
014	8	08	him
015	X>Y	32 81	
016	GTO 1	22 01	no
017	8	08	
018	8	08	
019	GTO 9	22 09	
020	*lbl 1	31 25 01	
021	X⇄Y	35 52	
022	.	83	move wumpus?
023	2	02	
024	X≤Y	32 71	
025	GTO 2	22 02	no
026	GSB 8	31 22 08	get new cave
027	STO B	33 12	
028	GTO 4	22 04	- - - - - - - - - -
029	*lbl 2	31 25 02	fall into pit?
030	RCL E	34 15	
031	int	31 83	
032	RCL A	34 11	
033	X=Y	32 51	
034	GTO 0	22 00	yes - pit 1
035	RCL E	34 15	
036	frac	32 83	
037	EEX	43	
038	2	02	
039	X	71	
040	X≠Y	32 61	PIT 2 ?
041	GTO a	22 31 11	no
042	*lbl 0	31 25 00	
043	0	00	
044	GTO 9	22 09	- - - - - - - - - -
045	*lbl a	32 25 11	bats get him?
046	RCL C	34 13	
047	RCL A	34 11	
048	X=Y	32 51	
049	GTO 0	22 00	
050	RCL D	34 14	
051	X≠Y	32 61	
052	GTO b	22 31 12	
053	*lbl 0	31 25 00	yes
054	3	03	
055	-X-	31 84	
056	GSB 8	31 22 08	get rnd cave
057	STO A	33 11	for player
058	GTO 4	22 04	- - - - - - - - - -
059	*lbl b	32 25 12	wumpus nearby?
060	0	00	
061	GSB 7	31 22 07	get 1st tunnel
062	GSB 3	31 22 03	set code if eq
063	1	01	to wumpus cave
064	GSB 7	31 22 07	
065	GSB 3	31 22 03	
066	2	02	
067	GSB 7	31 22 07	
068	GSB 3	31 22 03	
069	GTO c	22 31 13	- - - - - - - - - -
070	*lbl 3	31 25 03	compare tunnels
071	RCL B	34 12	to wumpus cave
072	X≠Y	32 61	
073	RTN	35 22	
074	.	83	set code when eq
075	1	01	
076	STO+9	33 61 09	- - - - - - - - - -
077	*lbl c	32 25 13	pits nearby?
078	0	00	
079	GSB 7	31 22 07	
080	GSB 3	31 22 03	
081	1	01	
082	GSB 7	31 22 07	
083	GSB 3	31 22 03	
084	2	02	
085	GSB 7	31 22 07	
086	GSB 3	31 22 03	
087	GTO d	22 31 14	- - - - - - - - - -
088	*lbl 3	31 25 03	compare tunnels
089	RCL E	34 15	to pit caves
090	int	31 83	
091	X=Y	32 51	
092	GTO 0	22 00	
093	X⇄Y	35 52	
094	RCL E	34 15	
095	frac	32 83	
096	EEX	43	
097	2	02	
098	X	71	
099	X≠Y	32 61	
100	RTN	35 22	
101	*lbl 0	31 25 00	set code
102	.	83	
103	0	00	
104	1	01	
105	STO+9	33 61 09	- - - - - - - - - -
106	*lbl d	32 25 14	bats nearby?
107	0	00	
108	GSB 7	31 22 07	
109	GSB 3	31 22 03	
110	1	01	
111	GSB 7	31 22 07	
112	GSB 3	31 22 03	

REGISTERS

0 cave 10	1 cave 11	2 cave 12	3 cave13	4 cave14	5 cave15	6	7	8 arrows	9 hints
S0 seed	S1 cave 1	S2 cave 2	S3 cave3	S4 cave4	S5 cave 5	S6 cave6	S7 cave7	S8 cave8	S9 cave9
A player move	B wumpus loc	C batl loc	D bat2 loc	E pits 1/2	I used				

Program Listing II

STEP	KEY ENTRY	KEY CODE	COMMENTS
113	2	02	
114	GSB 7	31 22 07	
115	GSB 3	31 22 03	
116	GTO C	22 13	- - - - - - - - -
117	*lbl 3	31 25 03	compare tunnels
118	RCL C	34 13	to bat caves
119	X=Y	32 51	
120	GTO 0	22 00	
121	X⇄Y	35 52	
122	RCL D	34 14	
123	X≠Y	32 61	
124	RTN	35 22	
125	*lbl 0	31 25 00	
126	3	03	set code if eq
127	CHS	42	
128	10^x	32 53	
129	STO+9	33 61 09	
130	GTO C	22 13	- - - - - - - - -
131	*lbl 5	31 25 05	is move or shot
132	0	00	legal?
133	GSB 7	31 22 07	
134	X⇄Y	35 52	
135	X=Y	32 51	
136	RTN	35 22	
137	1	01	
138	GSB 7	31 22 07	
139	X⇄Y	35 52	
140	X=Y	32 51	
141	RTN	35 22	
142	2	02	
143	GSB 7	31 22 07	
144	X⇄Y	35 52	
145	X=Y	32 51	
146	RTN	35 22	
147	GTO e	22 31 15	- error... - - -
148	*lbl C	31 25 13	
149	RCL A	34 11	recover from
150	ST I	35 33	error condition
151	DSP 3	23 03	and dsply hints
152	RCL 9	34 09	and position
153	RCL 8	34 08	
154	+	61	
155	-X-	31 84	dsply hints
156	P⇄S	31 42	
157	DSP 6	23 06	
158	RCL(i)	34 24	
159	P⇄S	31 42	
160	R/S	84	dsply position
161	*lbl 7	31 25 07	- - - - - - - - -
162	P⇄S	31 42	extract tunnels
163	RCL A	34 11	from player cave
164	ST I	35 33	
165	R↓	35 53	
166	EEX	43	
167	2	02	
168	X⇄Y	35 52	
169	y^x	35 63	
170	RCL (i)	34 24	
171	X	71	
172	frac	32 83	
173	EEX	43	
174	2	02	
175	X	71	
176	int	31 83	
177	P⇄S	31 42	
178	RTN	35 22	- - - - - - - - -
179	*lbl 8	31 25 08	random number
180	P⇄S	31 42	generator
181	RCL 0	34 00	
182	9	09	
183	9	09	
184	7	07	
185	X	71	
186	frac	32 83	
187	STO 0	33 00	
188	P⇄S	31 42	
189	F? 2	35 71 02	
190	RTN	35 22	
191	1	01	
192	5	05	
193	X	71	
194	1	01	
195	+	61	
196	int	31 83	
197	RTN	35 22	- - - - - - - - -
198	*lbl 9	31 25 09	dsply termination
199	1	01	
200	CHS	42	
201	ST I	35 33	
202	X⇄Y	35 52	
203	DSP 0	23 00	
204	PSE	35 72	
205	GTO (i)	22 24	- - - - - - - - -
206	*lbl A	31 25 11	shoot arrow
207	1	01	
208	STO-8	33 51 08	
209	X⇄Y	35 52	
210	GSB 5	31 22 05	legal shot?
211	RCL B	34 12	
212	X=Y	32 51	
213	GTO 9	22 09	wumpus killed
214	GSB 8	31 22 08	reloc wumpus
215	STO B	33 12	
216	RCL 8	34 08	
217	X≠0	31 61	arrows left?
218	GTO 4	22 04	yes
219	9	09	
220	9	09	
221	GTO 9	22 09	
222	R/S		

LABELS

A Shoot	B	C Recover	D	E Move
a batsnatch	b wum near	c pit near	d bat near	e error
0 used	1 used	2 used	3 used	4 ate
5 legal	6	7 ext tun	8 rnd num	9 endgame

FLAGS

0
1
2
3

SET STATUS

FLAGS		TRIG		DISP	
	ON OFF				
0	☐ ☒	DEG	☐	FIX	☒
1	☐ ☒	GRAD	☐	SCI	☐
2	☐ ☒	RAD	☐	ENG	☐
3	☐ ☒			n	6