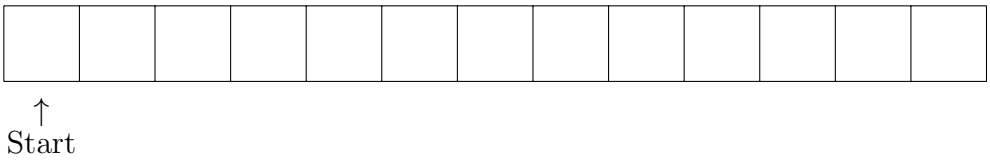
TURING PUZZLE

Petbotics, Inc. designs and manufactures (surprise!) **robotic pets**. As per federal law, Petbotics regularly tests their robots to make sure they won't one day **rise up and take over the world**.

The testing procedure for one particular model, **TY-NEE-BAHT**, begins by placing it on the designated space within the blank tape pictured below.



TY-NEE-BAHT uses a combination of its current **mode** and the currently drawn **letter** to decide what to write on the grid and how to move, based upon the **TY-NEE-BAHT Program**. For example:

3	Current mode
E	Currently drawn letter
R	Letter to overwrite
→	Direction to move
4	Mode to switch into

The above instruction directs a TY-NEE-BAHT which is currently in mode 3 and standing on the letter "E" to

- overwrite the "E" with an "R",
- move one square to the right (or loop to the left end of the tape if currently on the right end), and
- switch to mode 4.

What three-word message will be printed on the blank tape above when TY-NEE-BAHT powers down?

TY-NEE-BAHT always begins in mode 1, and it shuts itself off when it reaches a combination of mode and letter that is not defined within its program, or after following 1000 instructions.

1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5
	G	J	X		A	E	V		E	X	Y		A	J	E		A	B	J
A		V		S	A	F			R		G		A	G	E	A	A	O	Y
→	←	→	→	←	→	→	→	→	→	←	→	→	←	←	→	→	←	←	←
10	8	6	20	11	14	3	7	2	4	17	1	3	13	1	4	4	13	19	1

6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10	11	11	11	11
	B	J	O		G	V	Y		B	V	X		G	J	O		B	G	V		A	X	Y
		X			J		B			G	J		B	V	X		G	B	X		A		
→	→	←	→	→	←	←	←	→	→	→	←	→	←	→	←	→	←	→	→	←	←	→	←
5	11	6	22	6	20	13	6	7	1	14	11	8	2	17	12	9	3	11	16	11	12	17	4

12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16
	G	A	Y		E	J	S		V	S	Y		B	G	X		G	V	O
E	Y	A		B	M		S			S	B			J			B	Y	J
←	←	→	→	→	→	→	←	→	←	→	→	→	→	←	→	→	←	→	←
12	8	2	17	10	2	2	21	14	19	15	4	16	7	13	15	17	21	6	15

17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20	21	21	21	21	22	22	22	22
	J	X	Y		V	S	X		V	X	Y		G	V	Y		G	J	V		B	X	Y
E		B	Y			S		A	Y	B	J	K	B	O	V	S		B	X	N	G		J
←	←	→	←	←	←	→	←	→	←	→	→	←	→	←	←	←	←	←	→	→	←	→	→
18	1	15	8	18	12	19	6	20	5	14	9	5	12	12	20	22	6	15	10	1	21	14	7

Solution:

TY-NEE-BAHT's program (essentially a simplified **Turing machine**) outputs **AFREEMANSSAKE**, that is, "A free man's sake", a reference to the quest to escape from the control of the machines.