

When you type in the 8-digit number from last week, you successfully unlock the computer. You try to find any information you can on what this whole organization is about, but you can't immediately see it. When you are looking through an instant messaging system that you don't recognize, you spot a curious message from an anonymous sender. It says:

"We know that your organization is looking for us, and is trying to breach our systems. However, as you can see, we were way ahead of you and have already breached your systems. We give you one day to shut down this facility. If you don't, we will leak your information to the public and you will have to shutdown anyway, and additionally face a trial!"

Hmm, these people seem to know more. Maybe you can get some information out of them, so you decide to ask them who they are and what information they have, and they respond immediately:

"Who are you? And what can you tell us about this organization?"

"Ah, you're stalling now to get more time. That won't work. You still have one day to comply with our demands".

"No no, you're misunderstanding. We are a team of investigators and we've discovered that a couple of thieves escaped here. And we are now using their computer."

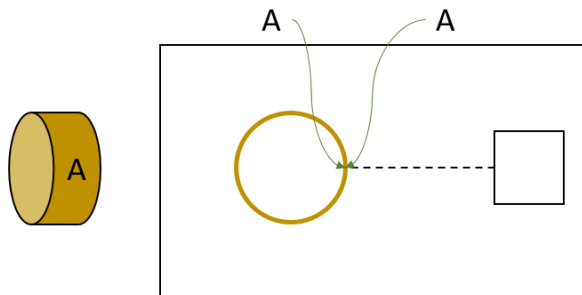
"Oh, well that makes things interesting. But how did you manage to unlock the computer with those weird instructions then?"

They continue:

"Actually, never mind. If you are the enemy of our enemy, that makes you our friend I guess. I'll go and get all information about the organization we have. If it is true what you say, you should be able to help us in the meantime. Since you are at their headquarters, you should see some kind of weird machine near you that's doing things with a tape of instructions. Sometimes it takes a piece of tape from an external input, sometimes it just rotates the tape in the machine, sometimes it removes a piece of tape from the machine, and sometimes it flips the tape. If it would take a piece from the external input, but it is empty, it stops. I would like to know what you can read on the tape after it stops, but since the machine is quite slow, it probably takes way too long to let the machine run on its own. Can you figure it out in another way?"

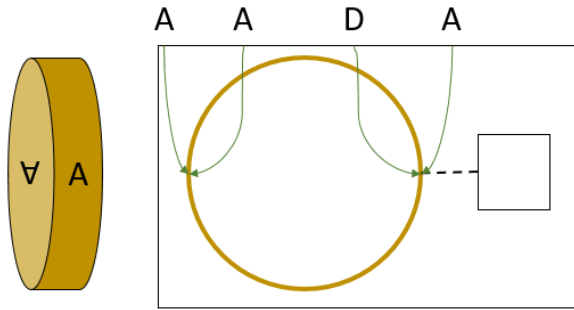
You look to your left and see a machine that looks roughly like the description. There is a clear start button, so you decide to press it. The machine starts working.

Currently, the double-sided tape contains one instruction in the front (the "A") and one in the back (which is also an "A", but it is not visible in the picture because it is on the inside of the tape, on the back of the visible "A").

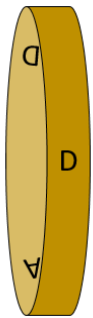


Since the machine reads an "A", it adds another piece of tape to the tape. It gets this new piece from a storage of tape pieces nearby (the input file gives this storage). As the first entry of the input file is "A,D", it adds a piece with an "A" in the front and a "D" in the back. It rotates the tape anti-clockwise so the old instruction goes up, detaches the tape beneath the old instruction, takes this next piece of tape with "A,D",

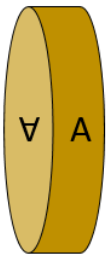
and attaches it to the tape again such that it is in front of the reader. The instruction on this side of the newly placed tape is an "A" again (you can also see the "A" on the back of the tape on the other side now).



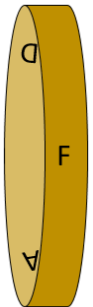
The machine again reads an "A", so it performs the same steps as before with the next input, namely "D,D".



Now, the machine reads a "D". It deletes this piece of tape. It detaches it on both sides, throws it in the trash bin, and attaches both sides of the original tape to each other again. Finally, it turns clockwise so that the instruction above the deleted "D" instruction is visible. This was the "A" that we saw in the previous step as well.

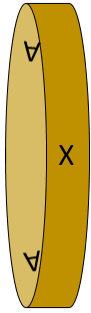


Reading an "A" again, the machine takes the next piece of the input, a "F,X" and adds it to the tape.

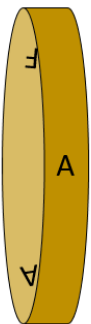


When the machine reads an "F", it flips the tape such that the outside becomes the inside and vice versa. You can now see the "X" instruction which was on the back of the "F" instruction, and on the other side

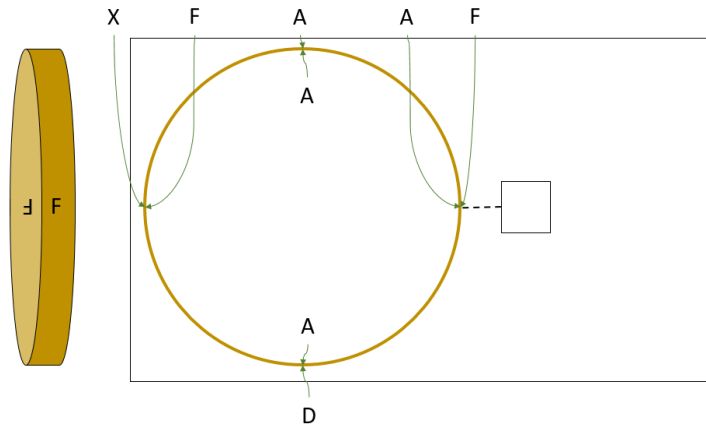
the original two "A" instructions.



When the machine reads anything else (in this case, "X"), it rotates the tape clockwise twice, so the instruction 2 instructions above the "X" is visible, which is the "A" on the back side of the original "A,A" piece. We can now also see the "F" at the front side of the "X" instruction and the "A" at the front side of a "D" instruction (we are still looking at the back of the tape) on the other side of the tape.



Then, the machine reads an "A", and adds the next input piece, an "A,F" to the tape. Note that since we are currently looking at the back of the tape, the instruction that is immediately visible is the "F" instruction.



The rest of the input of the machine is also given in the file. It is a list of " $\langle instructionFront \rangle, \langle instructionBack \rangle$ ", where $\langle instructionFront \rangle$ is the instruction at the front of the tape, and $\langle instructionBack \rangle$ is the instruction at the back. Note that we already added the first three pieces ("A,D", "D,D", "F,X" and "A,F") in the description above. When you start from the situation at the end of the description, they should not be added again.

To check your answer: After the machine is done, what can you read on the original front side of the tape (we are currently looking that the back side) starting from the reader and reading in anti-clockwise (upwards) direction, ignoring any "A"'s, "D"'s and "F"'s?