ElGamat: ElGamal over Matrices

In "simple" ElGamal, operations are performed in the group $\mathbb{Z}_p^*$: If g is a primitive root of this group, then we compute $h = g^\alpha \pmod{p}$. Here, g is a public parameter, h is the public key, and $\alpha \in \mathbb{Z}_{p-1}$ is a (random) private key.

We taught: Cool! Maybe we can create a more secure cryptosystem by computing over matrices: Let G be a 5×5 matrix with entries over $\mathbb{Z}_p^*$. Define $H = G^\alpha$. As above, G is a public parameter, H is the public key, and $\alpha \in \mathbb{Z}_{p-1}$ is a (random) private key.

Alas, some hacker totally broke our system, and found the private key α. Can you do the same?!

The value p, as well as matrices G and H are defined in file `Matrices.txt`. Once you found α, give it to `flag_gen.py` to compute the flag.