Problem 1:

Explanation: For individual steps in the DES process, I heavily used the code provided online and in the lecture notes. These provided such functions as turning the 8 raw bytes into 56 DES bits, and those bits into 16 round keys, as well as the arrays for the E-step, S-step, and P-step. Besides that, I abstracted the cipher heavily, down to the encryption round level and a separate isolated Feistel function. I found this necessary to track bitvectors through the process while trying to debug the encryption.

Encrypted:

```
36d2e582921b6b4a4729ec8a60a4915ba76f3fec1c010014c13444b4afbefb124743582e779a57cf992d87
1fcd7e178fe0c5b2c8ccc1a78fcae1aab4c09dd92388d20af1deaf36212e9fad48d6cf32d8299cf7bfe82e8fa
a32b3383d1877fb86eb489571936cdcda5d32f1bc9a359bd63f411305859fec912107c147cb77b2f459f944
561933e2ca54416929a35c2ce30438568de299dac4a33811a43d6b1e6ec75f86e0768b8ff5eea71a6bb890
7125a17a19997c153b4665123bf24bfe084f129a72292fe22fadf0ab59a06babc93f9aecc82545e35920fa68
a6eea18322458bf5a0fe9e50695326cb0ff211484b883a677b20a3318584f058b818fa594e9bb2744c67a5
ba2ad2d65e39d4522476efa8770e1bf5547cc90f12f73ec93102586e55c8a8e6bdeb8e16205040647bbcb8
be20b29d589da8c3fa2a9ec2f00dc056046c299bbb1532ef8c38b24c021558175055c4a95a1b193deec411
12afa5db015fbac30c6c95c83e3cb07f9b28c849b0330d4b4e84abf996f91ae58a499a44b87340c11ca0074
8b00072d7bf22bb383f3f2e2aa185921e974e23fc695bab5c2ddd27d5fa0e6e6de2af262f2608fa8cbc25bfb
dc4f5f8f0f785a1b4d4c63fa94f0c16601d8cff74856ca0a1ca8e1167db0a5a55e7dbb246202ae59835c16e9
0c1e0c5b2c8ccc1a78f726e8963d971baba5db79b6739f3fa4329acdfef24b1b13d361832c5bd814d7acf70
59e1b251f74e604116ecb90755cc43a12639c01917653cd945c9065737efa9401947fb9557568b567bdf05
9a474f95217f55ba63b3ed666854c2dda688b6acf0722076e3fd18d59b9109d4639c5a10dcc9dd17a3e78f
e956fb9687276ad8aefbfa2764ab669e7444e751fc396940fee2446b2e40d29f277a46ab9781445b25725c
d74215a01694f2566b33456851c5966303a2053f6a22d41581fa810f1668eb7761db9206b466a8a65e501
71f030c680a971cffd17e583060cd6e32ec5bd4ba1f9bda5976a883327bada116974b7e8220290949d5315
cd4d308e297b7789bcf7466c433e6effef150ea4a44df492f449509044104c47b32351b272672fc599ea692
6482920a08dd08cfdfdd19ae50585efebe84f51afbd7487e04b5e127457e37e615da2b55fafc317fecebf59a
```

Decrypted:

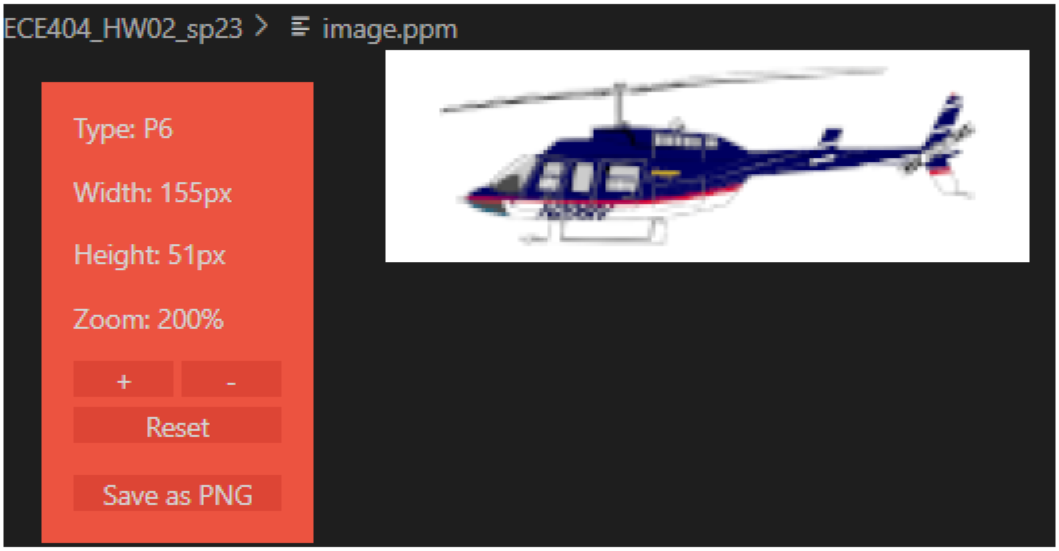
In the unforgiving world of Formula One, Lewis Hamilton abides at the top. He's the man to beat, the top earner, the most important voice, the most prominent figure - a Black man alone at the summit of motorsports' highest echelon. England's knight in Mercedes armor. Over the past 15 years, the 36-year-old Briton has won seven world championships, tying the record set by Ferrari's Michael Schumacher - the German F1 driver who was regarded as the greatest of all time until Hamilton broadsided him from that perch. At Sunday's Russian Grand Prix, Hamilton rallied through a late rain shower to claim the checkered flag on the way to becoming the first driver in the sport's history with 100 career victories. And that's besides his 100 career pole positions. As achievements go in racing, this is beyond otherworldly.

(Followed by two null bytes)

Problem 2:

Explanation: This script used almost the exact same code (encryption algorithm especially) from Problem 1, but there were a few adjustments as needed to process an image. Most notably: instead of writing the entire file's information to a single textstring, or even a single BitVector, I wrote every block separately to the output ppm. This required me to pass the filepointer object as an argument to encrypt method. For unknown reasons this worked much better. Besides that, it was mostly just a matter of changing modes to rb/wb.

Plain Image



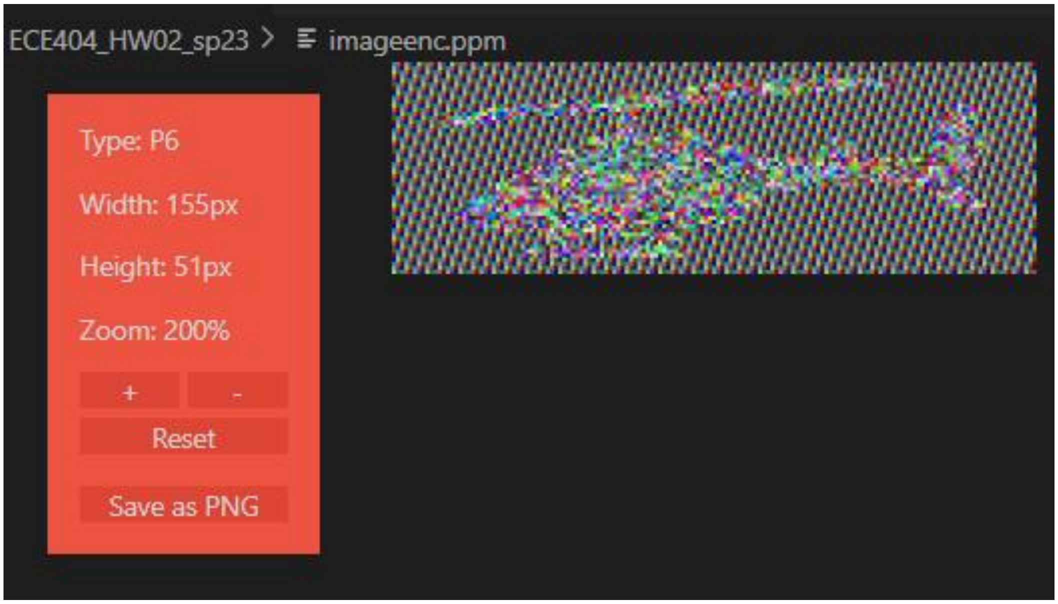
Type: P6

Width: 155px

Height: 51px

Zoom: 200%

Encrypted Image:



Type: P6

Width: 155px

Height: 51px

Zoom: 200%