CYBOLT
ACADEMY

LAB WORKBOOK

IAM Bootcamp

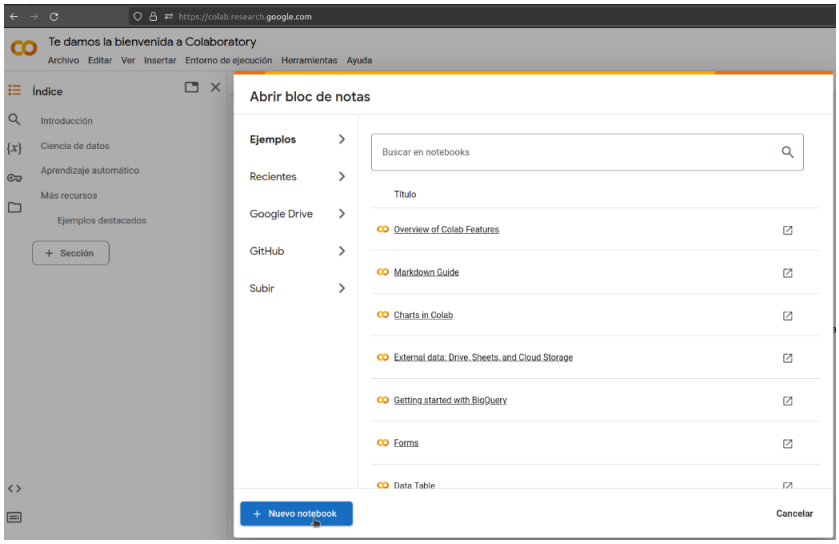
Identity & Access Management (IAM) Cybersecurity

Laboratory 1. Hashing Basics

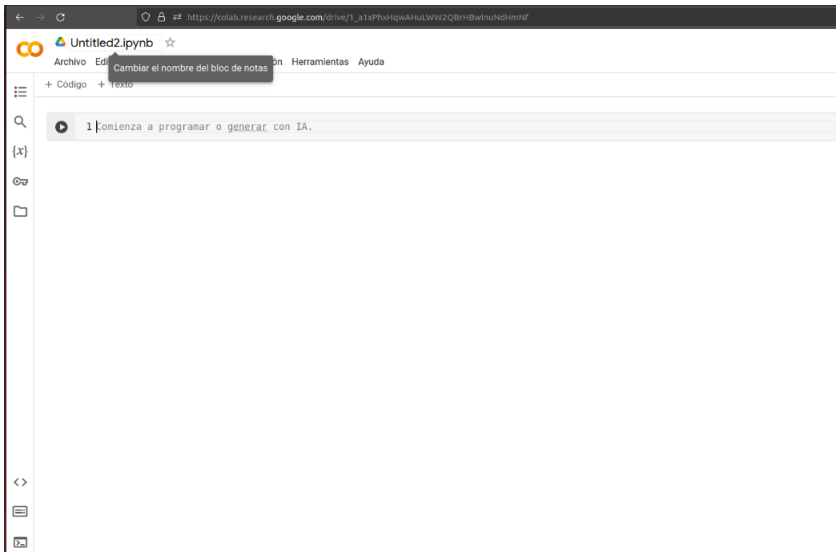
Prepare a Google Account.

TASK 1

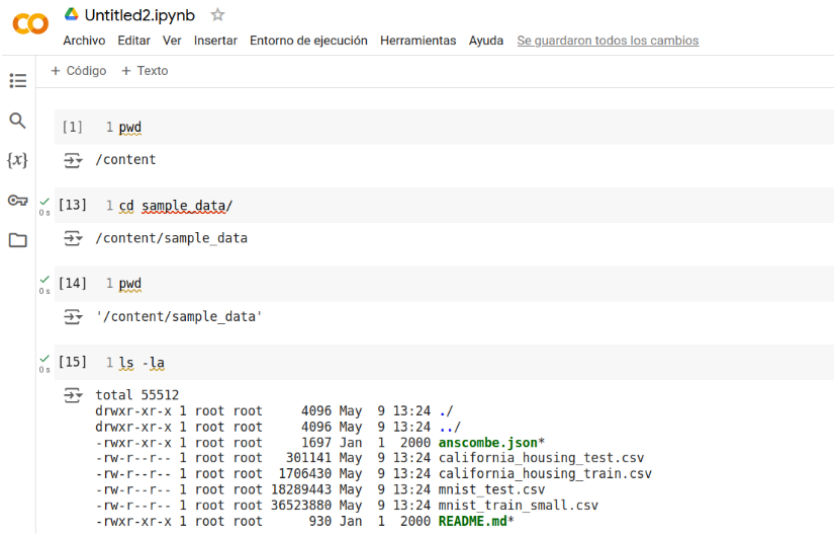
Step 1. Go to https://colab.research.google.com and click on **New Notebook**.



Step 2. You can change the notebook's name if you wish and use the cell to navigate on the machine provided by Google and program in Python or R.

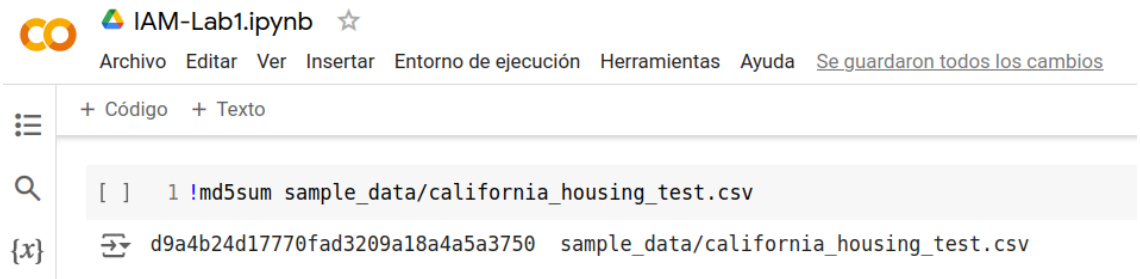


Step 3. Enter to the **sample_data** folder and locate the files in that folder.

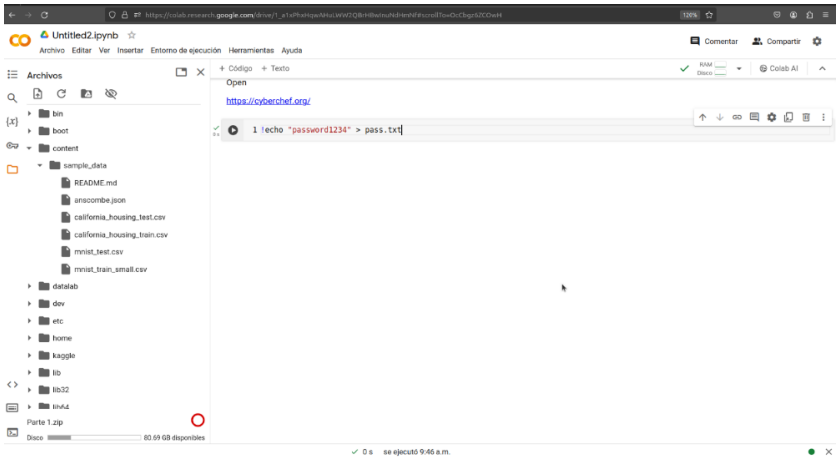


Step 4. Use `sha256sum` to get the hash of the **california_housing_test.csv** file.

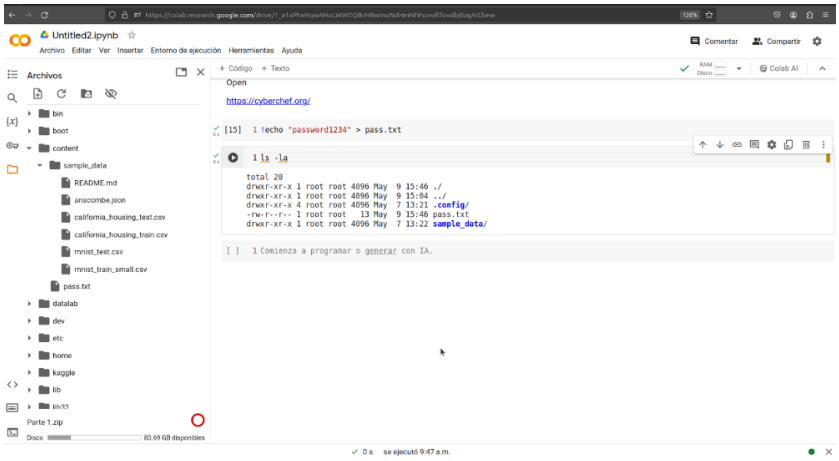
Step 5. Use `md5sum` to get the hash of the **california_housing_test.csv** file.



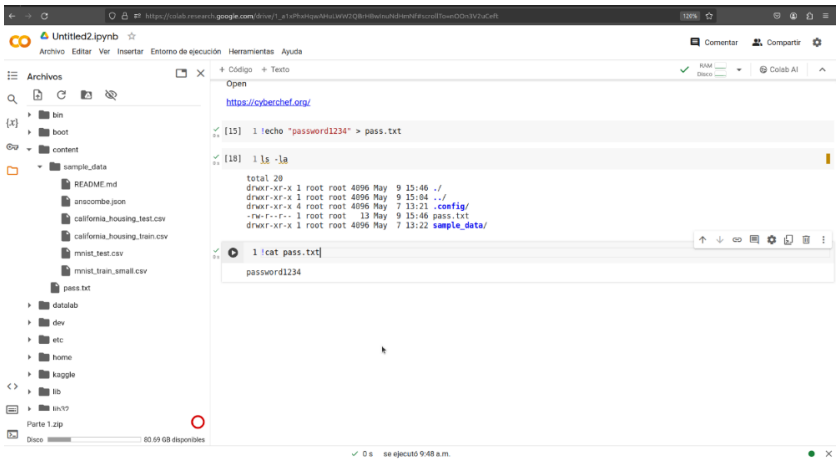
Step 6. Use the command `echo` to create a text file **pass.txt** containing **"password1234"**.



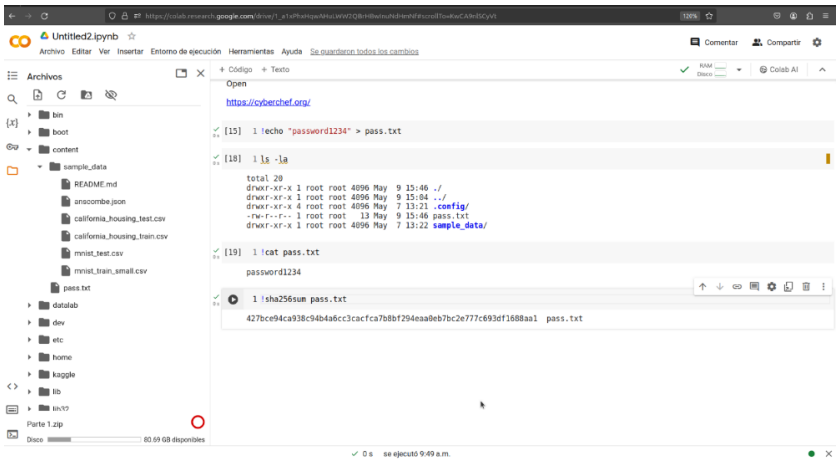
Step 7. Verify that it was created.



Step 8. Use the command `cat` to view the content of the created file.

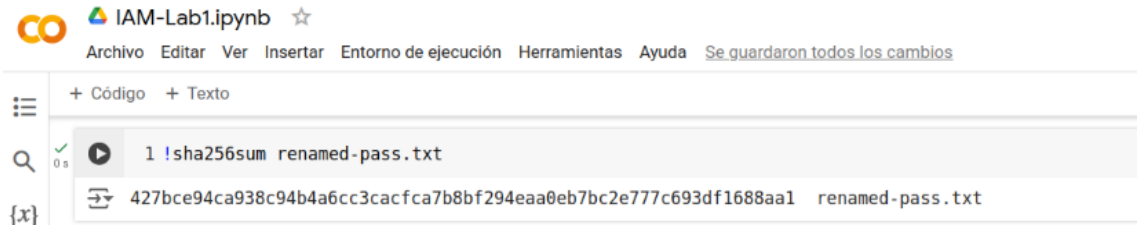


Step 9. Get the sha256 from the **pass.txt** file.



Step 10. Copy the file **pass.txt** and rename it like **renamed-pass.txt**. Use `cp` to perform this activity.

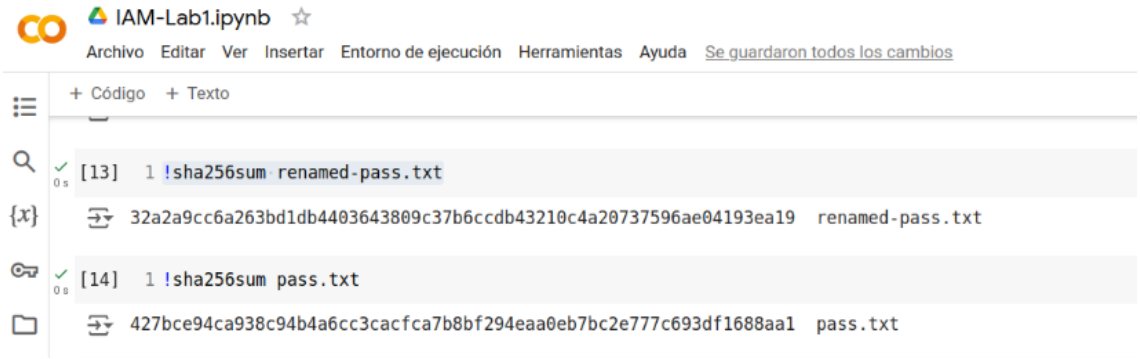
Step 11. Get the `sha256` from the file **renamed-pass.txt**.



Step 12. Please verify that the file, despite changing its name, still has the same content since the hash is the same.

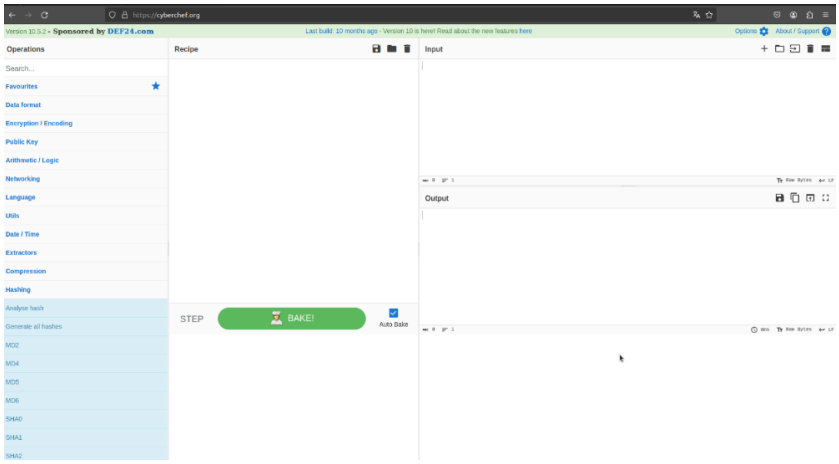
Step 13. Now, use `sed` to change the lowercase letter "p" to the uppercase letter "P" in the contents of the **renamed-pass.txt** file. Verify the change using `cat`.

Step 14. Get the hash of the **renamed-pass.txt** file.

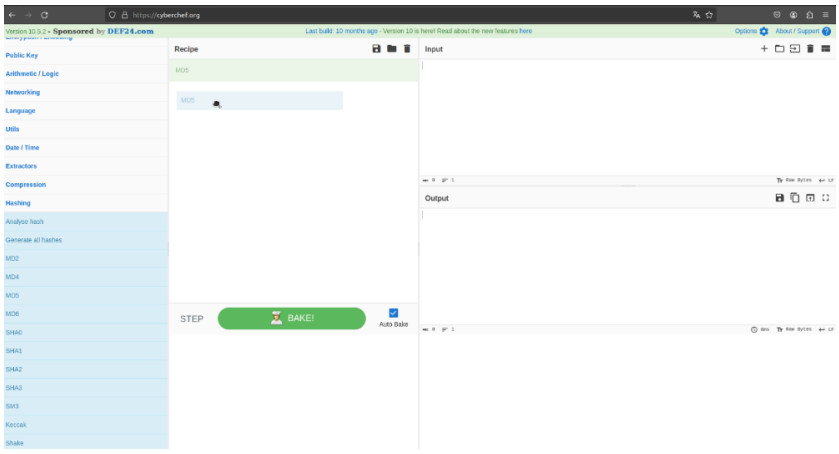


Task 2.

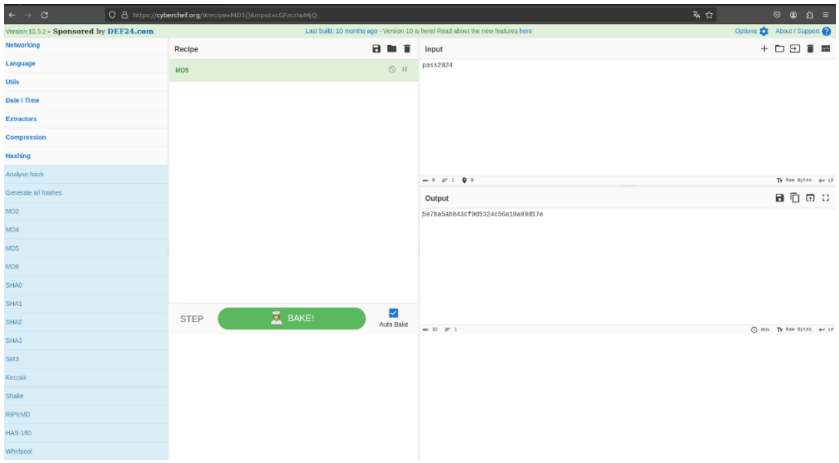
Step 15. Open https://cyberchef.org/.

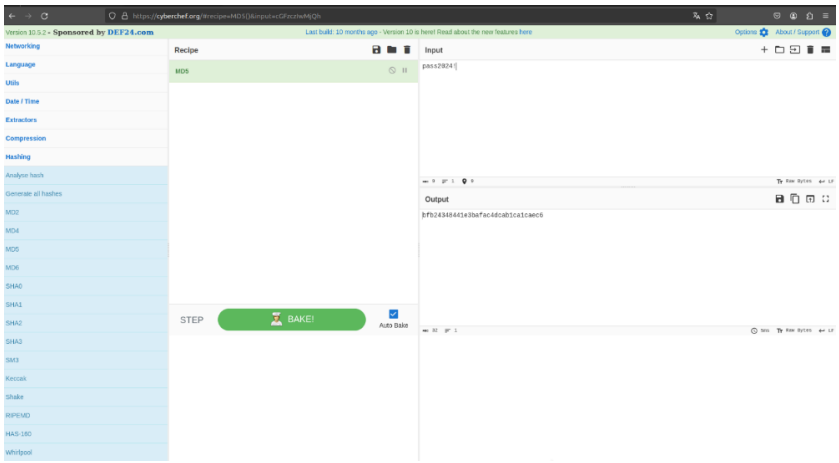


Step 16. Use the **Operations section** on the left to drag the **MD5 option** to the center, in **Recipe section.**

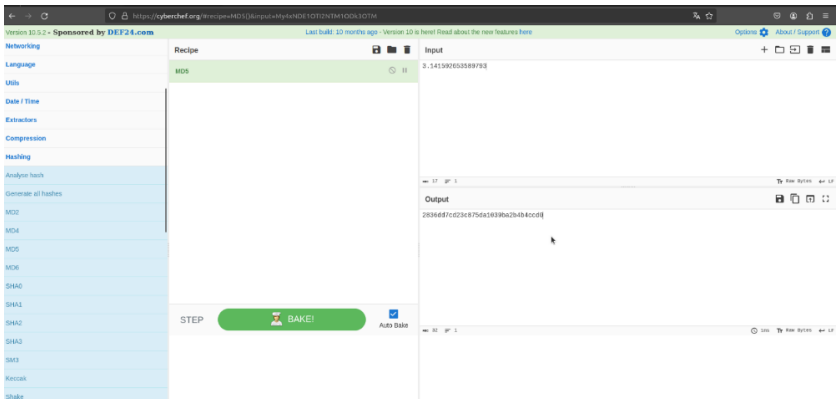


Step 17. In the upper right part, place the string "**pass2024**" in the input area and identify the output in the lower right part.



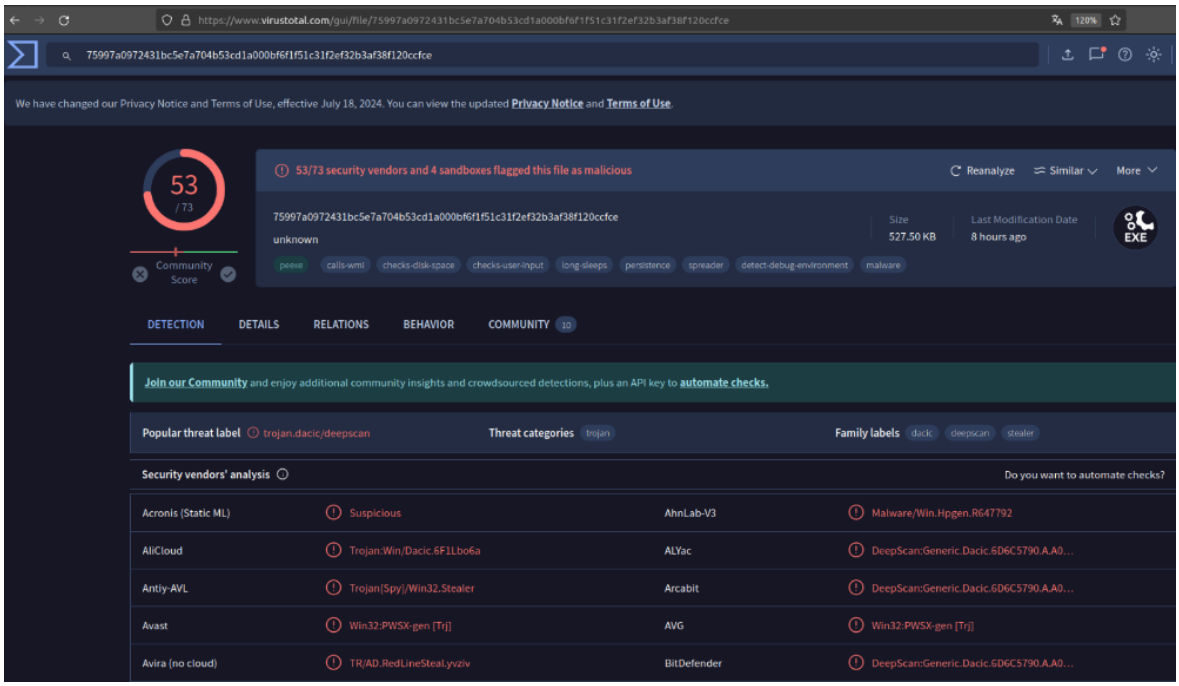


Step 18. Identify what happens if you change/add/remove a character from the text string.

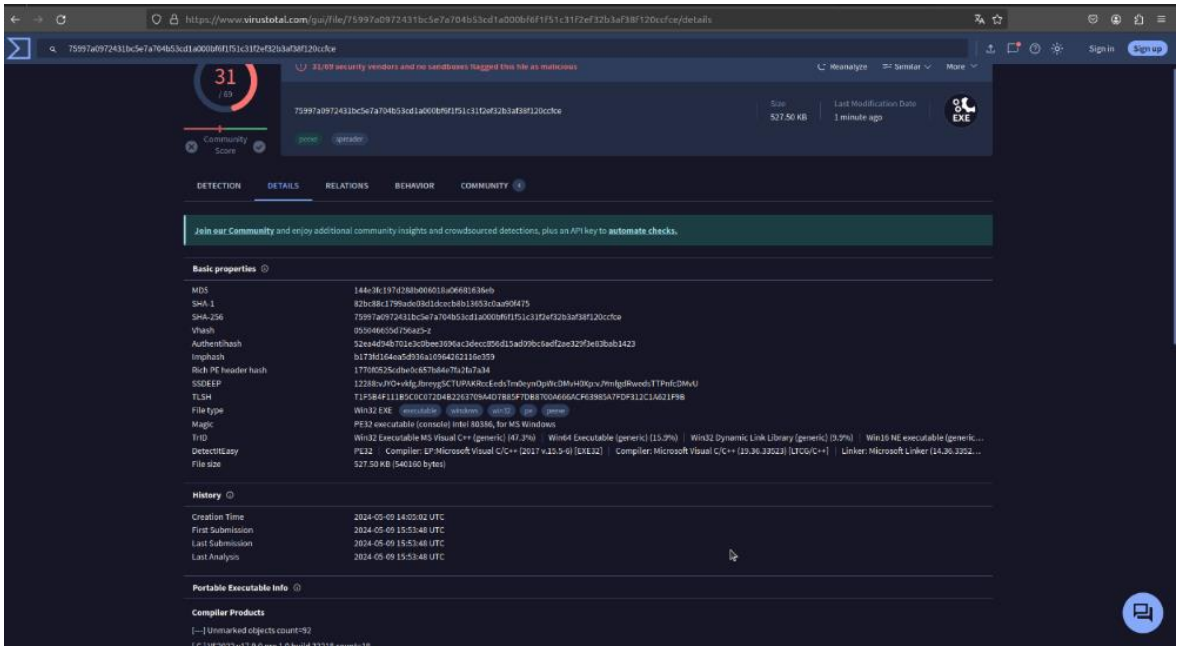


Step 19. Open https://www.virustotal.com/gui/home/upload , and in the **Search section**, enter the value `75997A0972431BC5E7A704B53CD1A000BF6F1F51C31F2EF32B3AF38F120CCFCE` and press **Enter**.

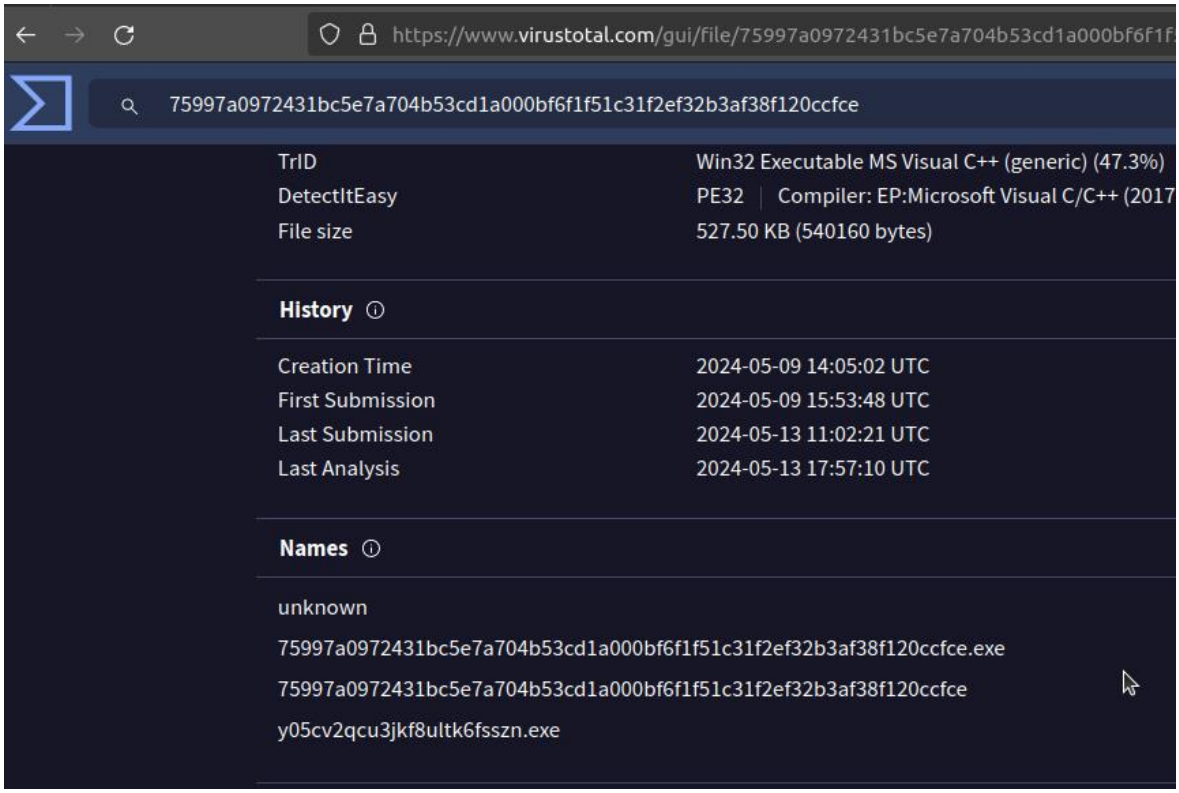
Step 20. Observe the information provided by the page.



Step 21. Go to the **Details section** and identify the information in **Basic Properties.**



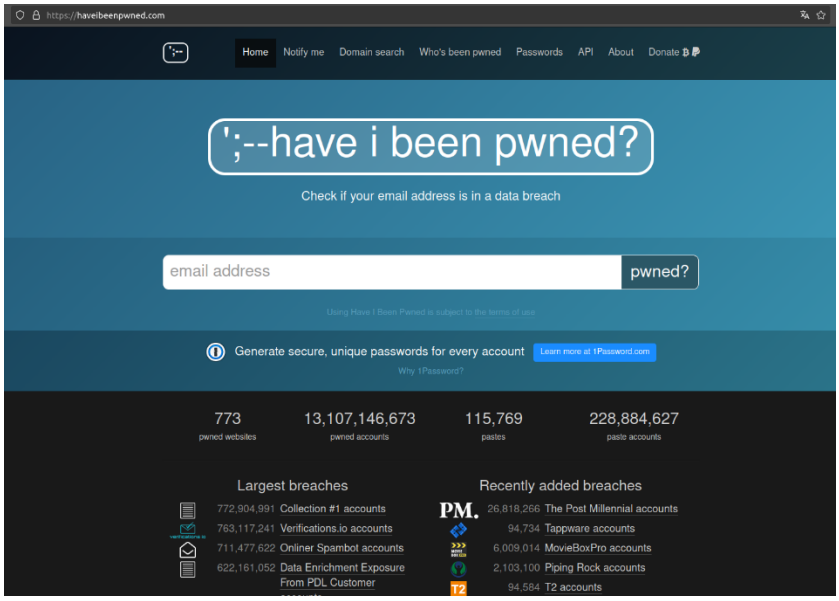
Step 22. The names associated with the consulted hash are observed in the **Names section.**



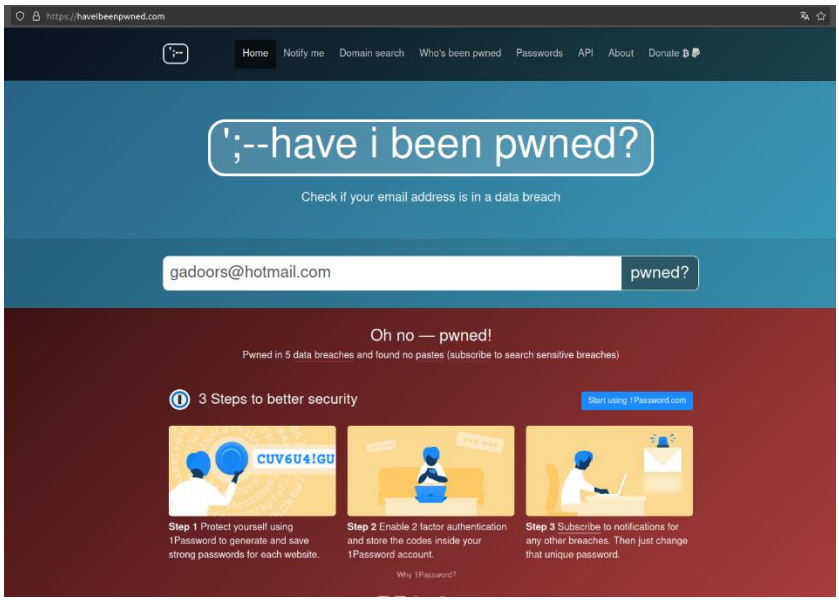
Laboratory 2. Password dumps

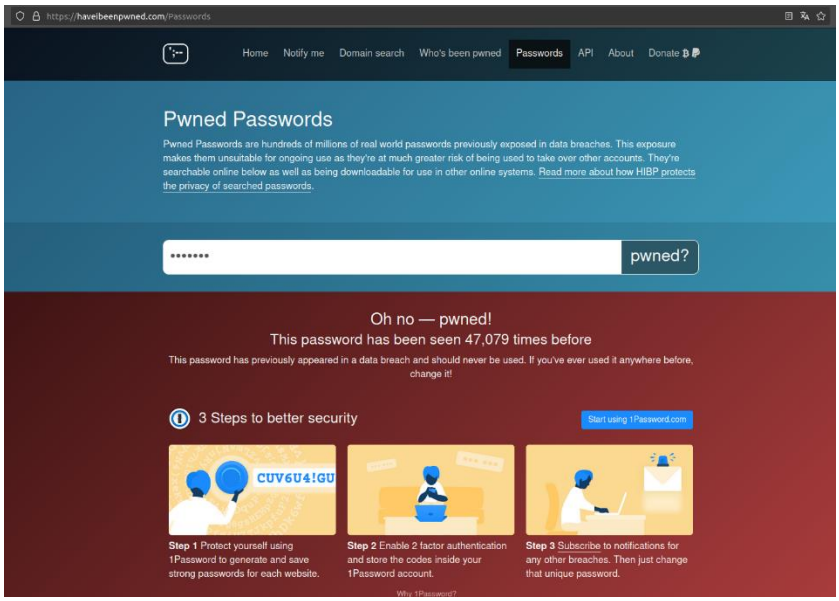
Task 1. Check your credentials

Step 1. Go to https://haveibeenpwned.com/ and navigate across the site.

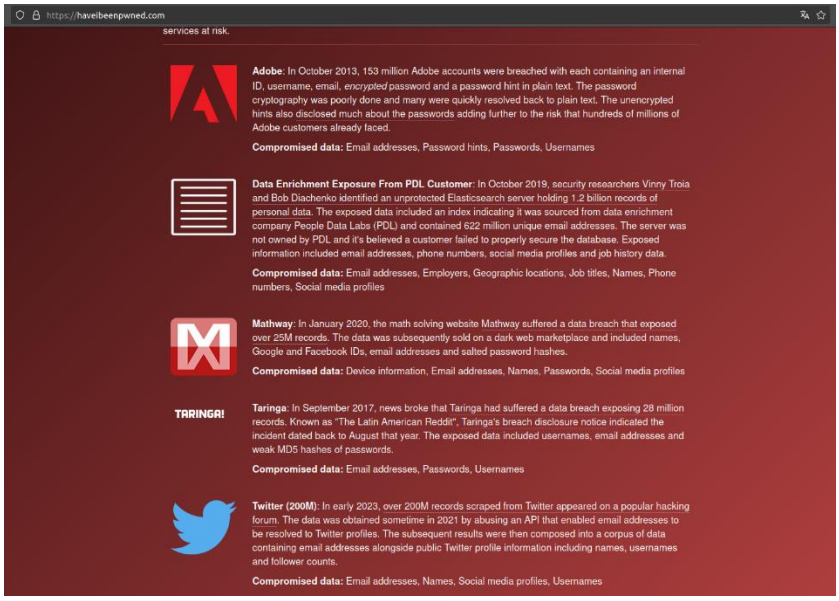


Step 2. Put your email address and password in the Home and Password options and check if you have been pwned.





Step 3. Check the information on breaches involved.



But Is it a safe search? Read this article https://www.troyhunt.com/ive-just-launched-pwned-passwords-version-2/#cloudflareprivacyandkanonymity or Go to API → Overview → Pwned Passwords → Overview and read about security search of passwords in the website of HIBP.

Task 2. Find passwords from password dumps

Scenery

You are a hacker and have found a repository of password dumps from the company Seven Kingdoms Corp. Try to obtain the passwords from that repository.

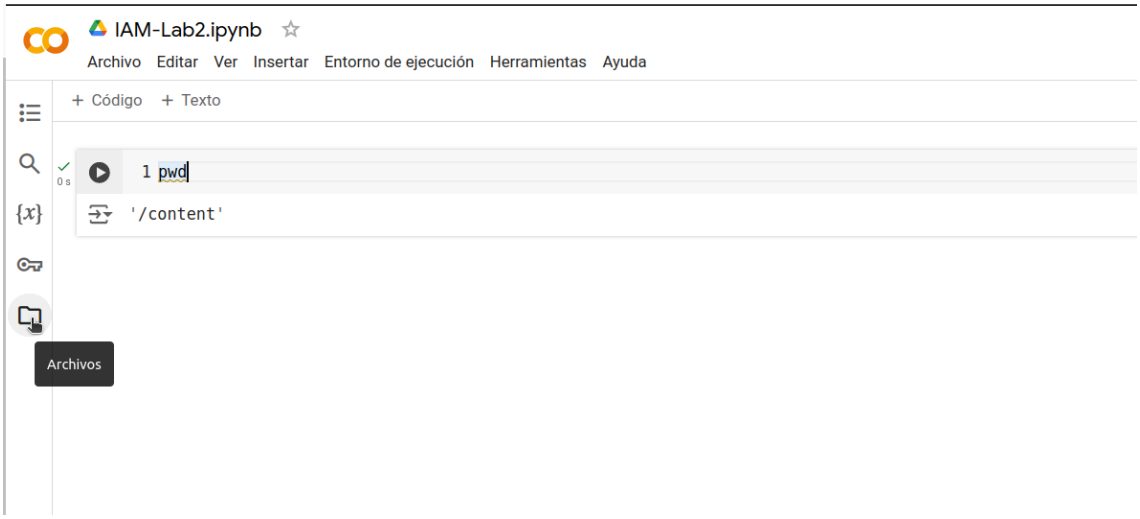
(For this exercise, we assume that the dumped passwords are in the HIBP repository).

What do you think about doing the activity?

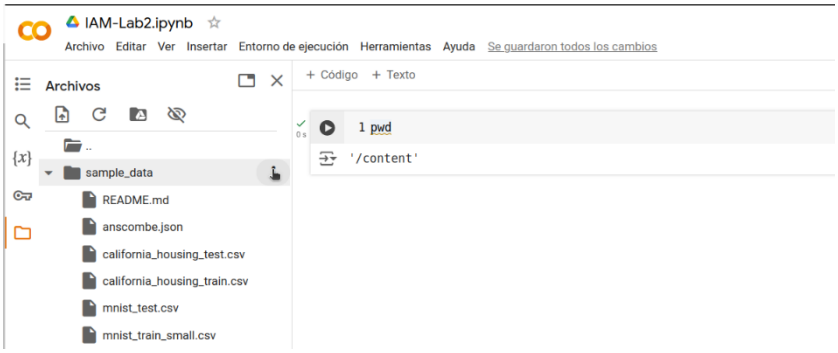
Task 2.1 Generate Passwords

Step 4. You can create a dictionary by putting all the passwords you can think of in a Txt file, or you can generate a dictionary with Python. In this exercise, we will create a dictionary using a set of keywords.

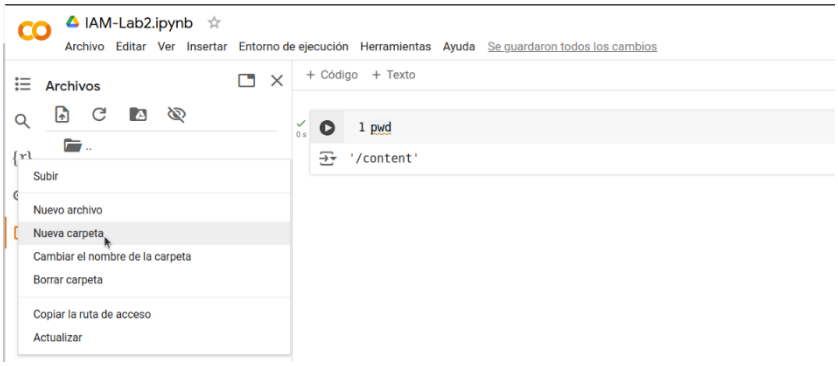
On the far right side, click on the **folder icon**.



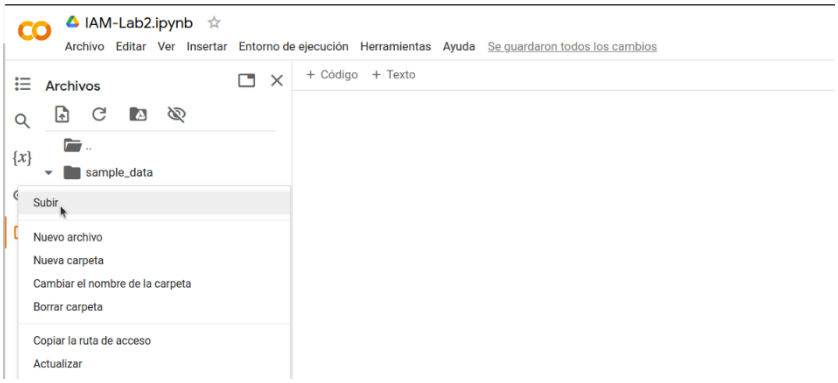
Step 5. Then click on the three dots in the **sample_data** folder.



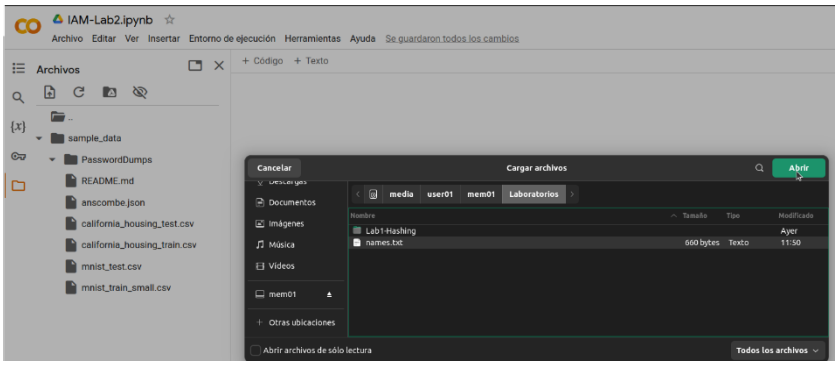
Step 6. Create a new folder called **PasswordDumps**.

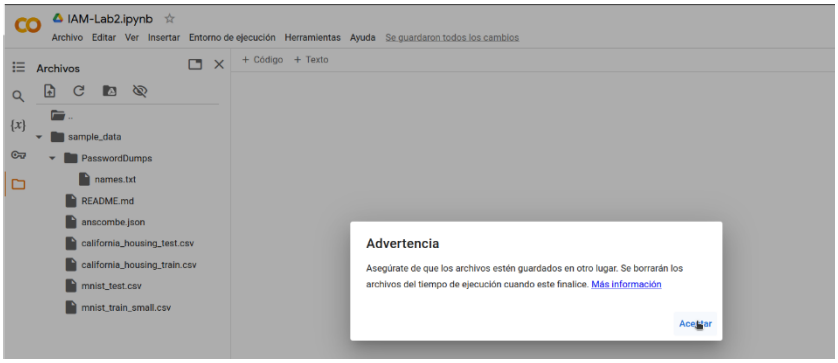


Step 7. Upload the text file with the names of the possible passwords to the created folder.



Step 8. Click **OK**, and then in the Warning box, click **OK**.

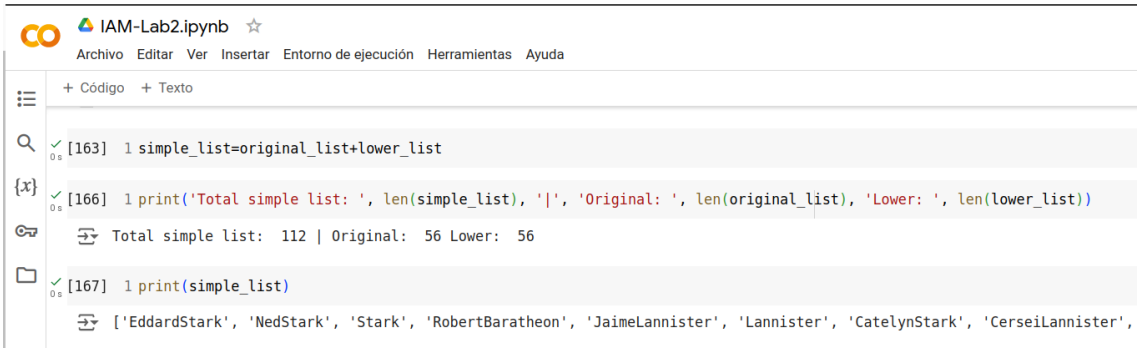




Step 9. Enter the **PasswordDumps** folder and verify that the Txt file is found.

Step 10. Start creating your password list. First, create two lists: 1 with the passwords in the **names.txt** file (**original_list**) and another with the same passwords in lowercase (**lower_list**). Verify that the lists are correct.

Step 11. Join the two lists into one (**simple_list**) for greater ease of use of the data.



Step 12. Many passwords have this structure: '**password2023**', '**qwerty2022**', etc. Create a list (**list_range**) with the years from 2015 to 2023 (This is just an example; you can later try other combinations of numbers such as 1234, 9876, 1111, etc.).

Step 13. Create a list (**years_list**) where the years are added to the end of the **simple_list**.

Step 14. Create a new list (**total_list**) that includes **year_list** (list of uppercase and lowercase passwords + years) and **simple_list** (list of uppercase + lowercase passwords).

The **total_list** is the passwords generated by the company Seven Kingdoms Corp.

Task 2.2 Calculate Hash

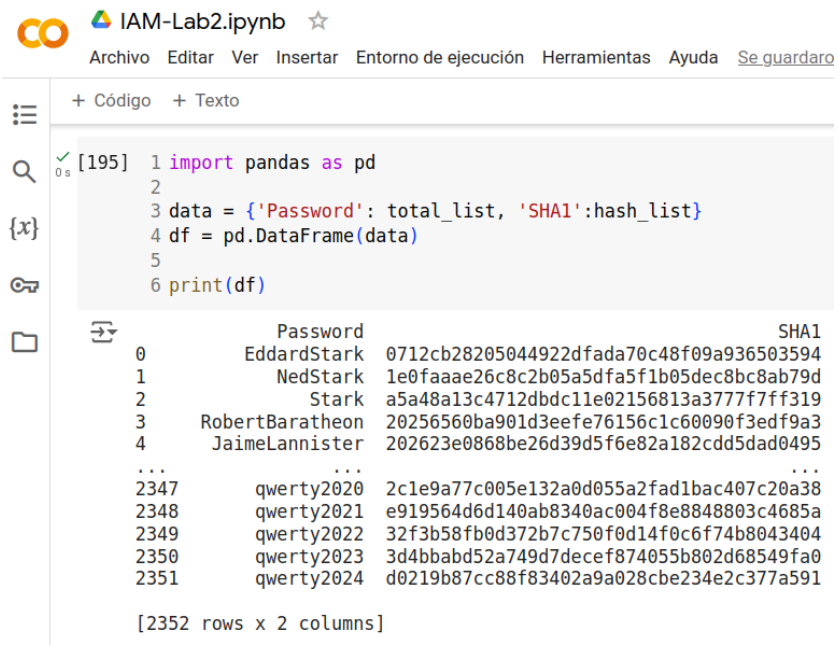
To carry out this sub-task, you can visit https://www.geeksforgeeks.org/sha-in-python/

Step 15. Try generating the **SHA1** for a string.

Step 16. Replicate the activity for the entire list (**total_list**).

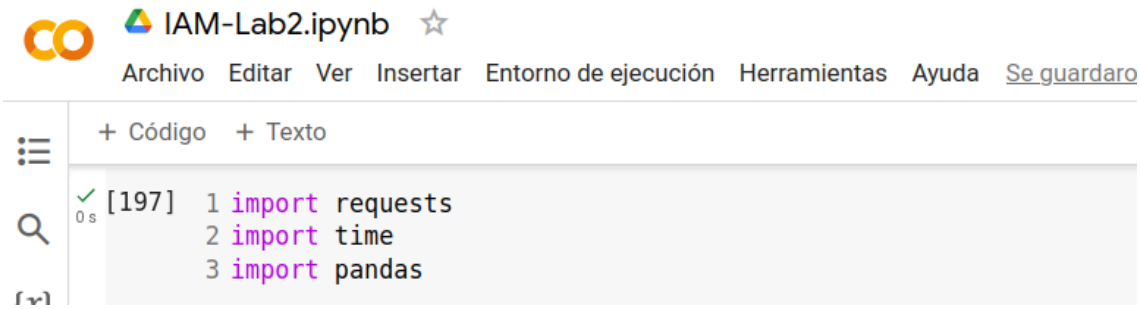
Step 17. Create a Data Frame to associate the hashes with the passwords.

Reference: https://www.geeksforgeeks.org/different-ways-to-create-pandas-dataframe/



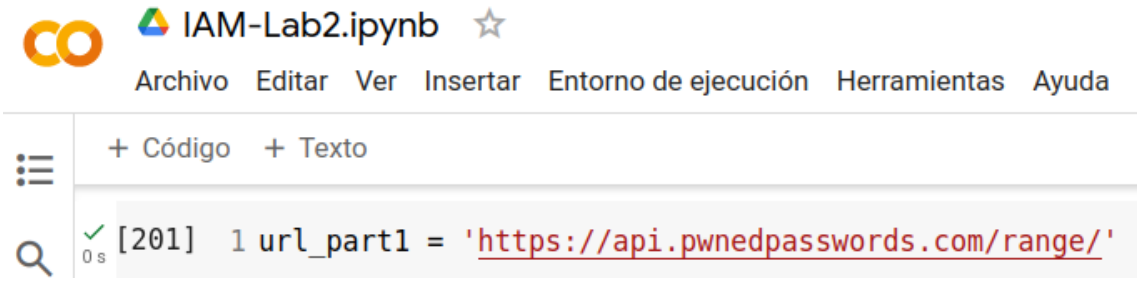
Task 2.3 Search SHA1 in Password Dump

Step 18. Import the following libraries:



Step 19. Declare the HIBP URL variable where to query **SHA1** hashes.

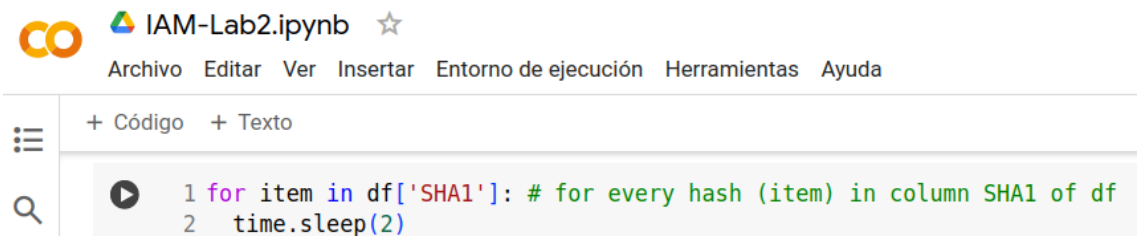
For more information, see:
https://haveibeenpwned.com/API/v3#PwnedPasswords



Step 20. Start writing Python code to search for SHA1s in the HIBP Password Dumps database.

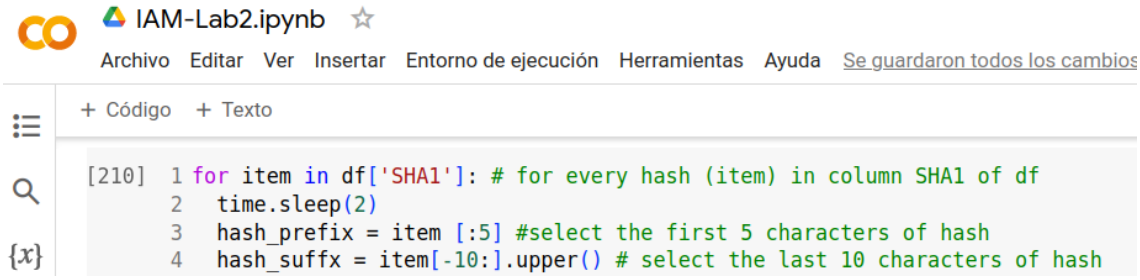
TIP: Use **time.sleep** (2) to avoid crashes from automated queries.

Where are the hashes and passwords for each hash in the data frame?

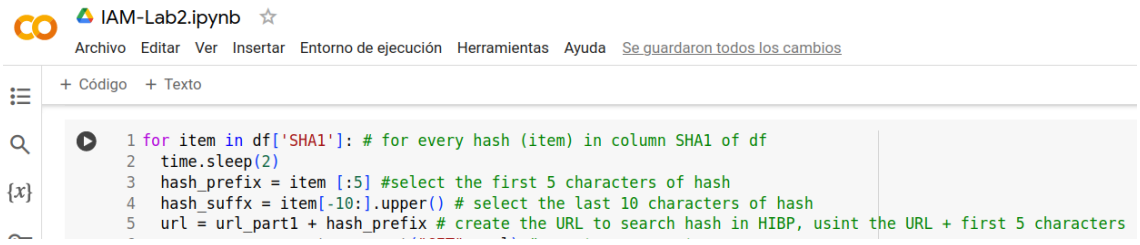


Step 21. Declare two variables to get the first five characters of the hash and the last five characters.

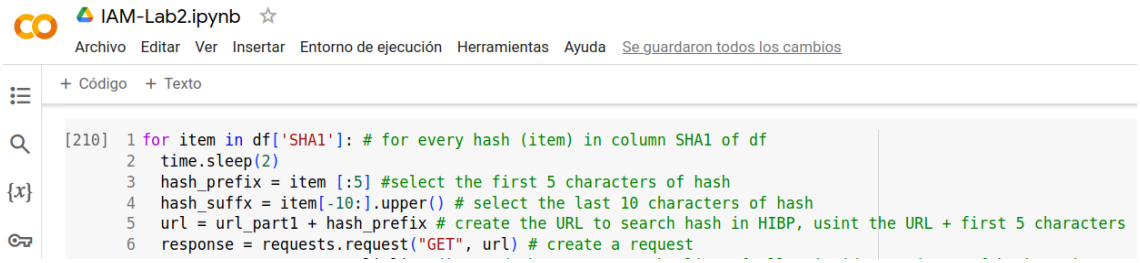
Remember that to search in HIBP, you must provide the first five characters and compare the last ones with the results obtained.



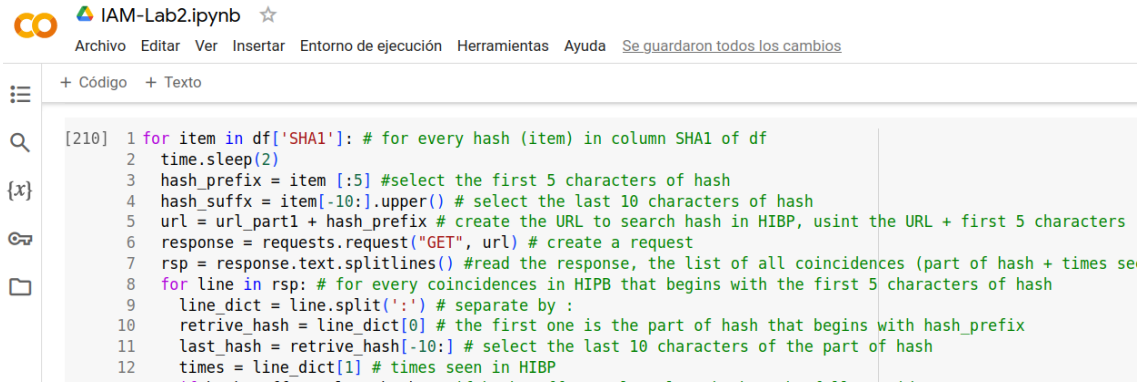
Step 22. Create the full URL to look up the hash.



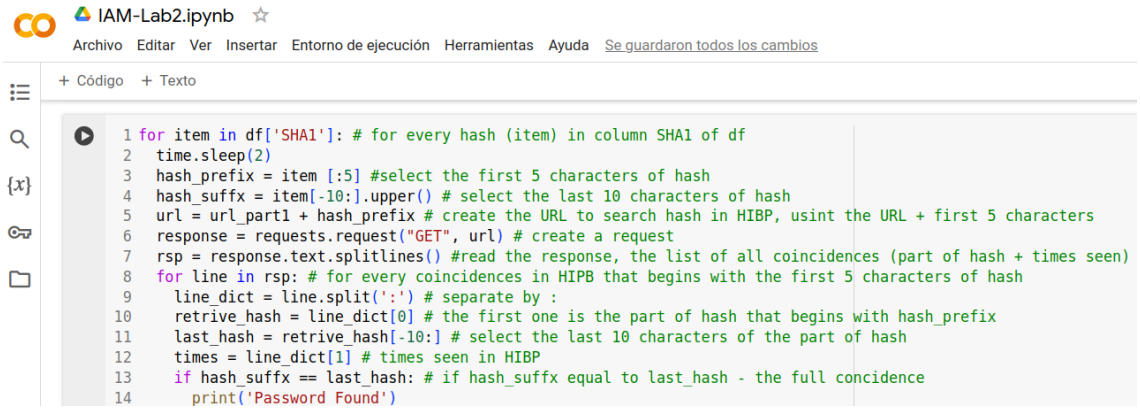
Step 23. Request the **HIBP** page and read the response provided.



Step 24. Read the information provided by **HIBP** and prepare the variables that will help you find the matches.

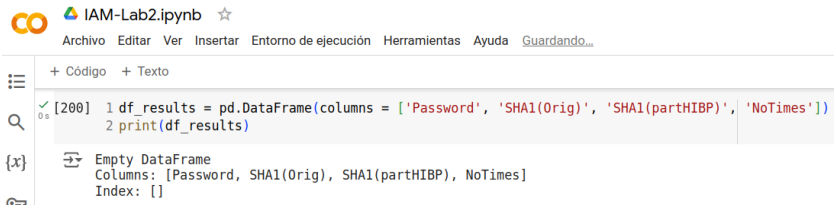


Step 25. Look for hash matches in the results obtained from **HIBP**.

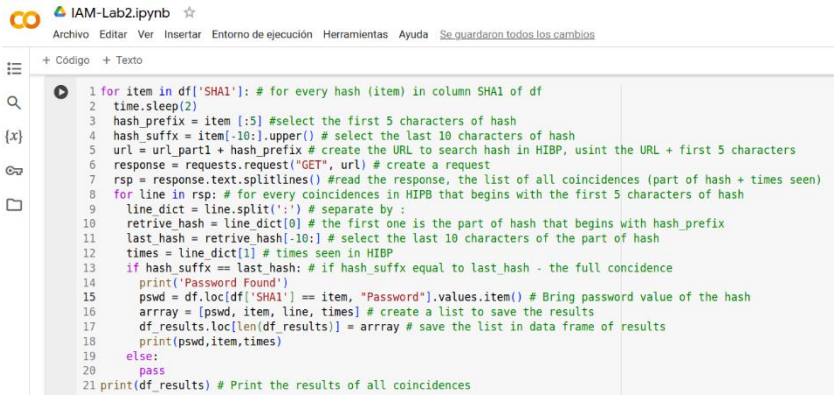


Task 2.4 Compare the results.

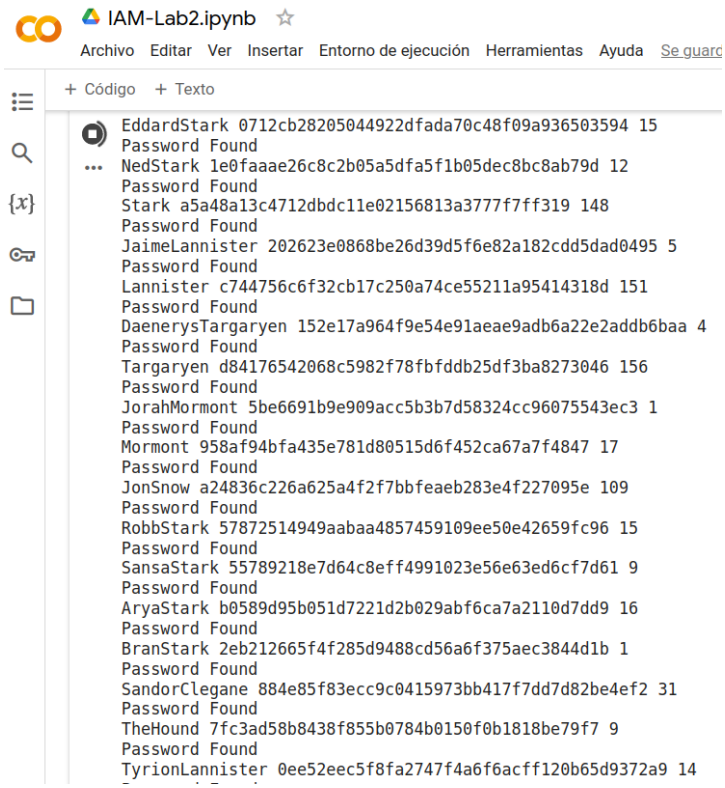
Step 26. Create a **DataFrame** (**df_results**) to store the password data found in the HIBP database.



Step 27. Identify which password each hash corresponds to and save it in the results data frame (**df_results**)



Step 28. Verify passwords found in **HIBP.**



Laboratory 3. Cryptography

Task 1. Symmetric Encryption

Step 1. Create a txt file (**clear_message.txt**) with the text ***"Este es un mensaje en texto claro."***

```
[ ]  1 !echo "Este es un mensaje en texto claro" > clear_message.txt
```

```
[ ]  1 ls -la
```

```
total 28
drwxr-xr-x 1 root root 4096 May 23 01:08 ./
drwxr-xr-x 1 root root 4096 May 23 00:37 ../
-rw-r--r-- 1 root root   34 May 23 01:02 clear_message.txt
```

Step 2. Use `cat`, to verify its content.

```
1 !cat clear_message.txt
```

```
Este es un mensaje en texto claro
```

Step 3. Use `openssl` to create an **encrypted_message** file from the **clear_message.txt file** with:

```
!openssl aes-256-cbc -e -in clear_message.txt -out encrypted_message
```

When required, enter an encryption key. As shown in the following image.

```
[ ]  1 !openssl aes-256-cbc -e -in clear_message.txt -out encrypted_message

enter AES-256-CBC encryption password:
Verifying - enter AES-256-CBC encryption password:
*** WARNING : deprecated key derivation used.
Using -iter or -pbkdf2 would be better.
```

Step 4. Verify the contents of the **encrypted_message file**.

```
1 !cat encrypted_message

Salted__ï¿½SmsBO!ï¿½ï¿½\Ñrï¿½tï¿½ï¿½~|ï¿½ï¿½|ï¿½vï¿½ï¿½ï¿½ï¿½ï¿½ï¿½WizcqyD~ï¿½ï¿½5ï¿½
```

Step 5. Decrypt the **encrypted_message** message to the **encrypted_message.txt** file, using:

```
!openssl aes-256-cbc -d -in encrypted_message -out decrypt_message.txt
```

Enter the key from the previous step.

```
[ ]  1 !openssl aes-256-cbc -d -in encrypted_message -out decrypt_message.txt

enter AES-256-CBC decryption password:
*** WARNING : deprecated key derivation used.
Using -iter or -pbkdf2 would be better.
```

Step 6. Verify that the message was decrypted using `cat`.

```
1 !cat decrypt_message.txt

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```

Step 7. To strengthen the encryption use `-iter` y `-pbkdf2`. Create a new encrypted file **2_encrypted_message** from **clear_message.txt**.

```
!openssl aes-256-cbc -pbkdf2 -iter 1000 -e -in clear_message.txt -
out 2_encrypted_message
```

Step 8. Enter the password to encrypt the **file 2_encrypted_message**.

```
[ ]  1 !openssl aes-256-cbc -pbkdf2 -iter 1000 -e -in clear_message.txt -out 2_encrypted_message

enter AES-256-CBC encryption password:
Verifying - enter AES-256-CBC encryption password:
```

Step 9. Verify that the **2_encrypted_message** file was created.

```
[ ]  1 ls -la

total 36
drwxr-xr-x 1 root root 4096 May 23 01:27 ./
drwxr-xr-x 1 root root 4096 May 23 00:37 ../
-rw-r--r-- 1 root root   34 May 23 01:27
-rw-r--r-- 1 root root   64 May 23 01:25 2_encrypted_message
-rw-r--r-- 1 root root   34 May 23 01:02 clear_message.txt
drwxr-xr-x 4 root root 4096 May 21 13:23 .config/
-rw-r--r-- 1 root root   34 May 23 01:08 decrypt_message.txt
-rw-r--r-- 1 root root   64 May 23 01:06 encrypted_message
drwxr-xr-x 1 root root 4096 May 21 13:23 sample_data/
```

Step 10. Use `cat` to read the contents of the **2_encrypted_message** file.

```
1 !cat 2_encrypted_message

Salted__&^��73&p��{x�b����:� N��:t���O�;48�x��G�ű���3��ₔ�
```

Step 11. Decrypt the **2_encrypted_message** file in the **decrypt_message** file with the key used for encryption.

```
[ ]  1 !openssl aes-256-cbc -pbkdf2 -iter 1000 -d -in 2_encrypted_message -out 2_decrypt_message

enter AES-256-CBC decryption password:
```

Step 12. Using `cat` verifies that the file was decrypted.

```
[ ]  1 !cat 2_decrypt_message

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```

Task 2. Asymmetric Encryption

Step 13. Use `openssl` to generate a private key **private-key.pem** of size 2048 bits.

```
!openssl genrsa -out private-key.pem 2048
```

Step 14. Verify that the private key was created.

```
[ ]  1 ls -la

total 44
drwxr-xr-x 1 root root 4096 May 23 02:41 ./
drwxr-xr-x 1 root root 4096 May 23 00:37 ../
-rw-r--r-- 1 root root   34 May 23 01:27 2_decrypt_message
-rw-r--r-- 1 root root   64 May 23 01:25 2_encrypted_message
-rw-r--r-- 1 root root   34 May 23 01:02 clear_message.txt
drwxr-xr-x 4 root root 4096 May 21 13:23 .config/
-rw-r--r-- 1 root root   34 May 23 01:08 decrypt_message.txt
-rw-r--r-- 1 root root   64 May 23 01:06 encrypted_message
-rw------- 1 root root 1704 May 23 02:40 private-key.pem
```

Step 15. Get the public key **public-key.pem** from the private **key private-key.pem**.

```
[ ]  1 !openssl rsa -in private-key.pem -pubout -out public-key.pem

writing RSA key
```

Step 16. Reads the contents of the public key **public-key.pem**.

```
[ ]  1 !cat public-key.pem

-----BEGIN PUBLIC KEY-----
MIIBIjANBgkqhkiG9w0BAQEFAAOCAQ8AMIIBCgKCAQEArTDgPRV99y3VJY4J3+x4
44b3bdU2cAEjAactge25hmX482tPMWJVNDcOGm79hbyjQrjiKIcAIfhQLi+hXP2U
CbvmNM7kjVyPSujvaJTS1mgvb98pzOzRVzHYZadt3NZJRI7MUSPXR0+ouShC+3RI
+MXAEf0S3XJTsNNb2aZNZuQ+kUH60q04vQmvgQ1BijqLt55UdJKcDP+VFT/ive06
iObPbDpNNK/z59TPCCZ+sEERVdldGXWy/JfzTPDXUgo8cY3Q8xblQaM7DpoECGGY
kyOZ4qP/Rdwyie9VpTNOHf5tV/4NGw76RuHYOUuHFEKZ1F+l+MdpBBomArcY6VuV
1QIDAQAB
-----END PUBLIC KEY-----
```

Step 17. Reads the contents of the private key **private-key.pem**.

```
[ ]  1 !openssl rsa -in private-key.pem -text -noout
```

```
Private-Key: (2048 bit, 2 primes)
modulus:
    00:ad:30:e0:3d:15:7d:f7:2d:d5:25:8e:09:df:ec:
    78:e3:86:f7:6d:d5:36:70:01:23:01:a7:2d:81:ed:
    b9:86:65:f8:f3:6b:4f:31:62:55:34:37:0e:1a:6e:
    fd:85:bc:a3:42:b8:e2:28:87:00:21:f8:50:2e:2f:
    a1:5c:fd:94:09:bb:e6:34:ce:e4:8d:5c:8f:4a:e8:
    ef:68:94:d2:d6:68:2f:6f:df:29:cc:ec:d1:57:31:
    d8:65:a7:6d:dc:d6:49:44:8e:cc:51:23:d7:47:4f:
    a8:b9:28:42:fb:74:48:f8:c5:c0:11:fd:12:dd:72:
    53:b0:d3:5b:d9:a6:4d:66:e4:3e:91:41:fa:d2:ad:
    38:bd:09:af:81:0d:41:8a:3a:8b:b7:9e:54:74:92:
    9c:0c:ff:95:15:3f:e2:bd:ed:3a:88:e6:cf:6c:3a:
    4d:34:af:f3:e7:d4:cf:08:26:7e:b0:41:11:55:d9:
    5d:19:75:b2:fc:97:f3:4c:f0:d7:52:0a:3c:71:8d:
    d0:f3:16:e5:41:a3:3b:0e:9a:04:08:61:98:93:23:
    99:e2:a3:ff:45:dc:32:89:ef:55:a5:33:4e:1d:fe:
    6d:57:fe:0d:1b:0e:fa:46:e1:d8:39:4b:87:14:42:
    99:d4:5f:a5:f8:c7:69:04:1a:26:02:b7:18:e9:5b:
    95:d5
publicExponent: 65537 (0x10001)
privateExponent:
    05:e2:7d:6e:bb:3e:62:a4:8d:33:af:a3:58:97:4d:
    8b:96:f2:ec:fe:f6:7b:66:21:27:e0:63:d4:a0:87:
    67:70:80:93:2e:28:17:35:50:50:2c:0c:ba:76:34:
    a9:68:d2:f7:f9:eb:3e:aa:f3:a4:b3:d8:c4:46:51:
    b5:24:ad:4a:8a:b6:be:ea:f1:6b:77:8e:80:e2:45:
    a6:e7:e3:a5:6d:b8:80:3f:1f:74:50:99:a9:07:a4:
    62:de:86:5b:9f:71:06:e2:29:41:6f:e1:29:3c:4f:
    84:81:c0:8b:90:69:c8:56:2e:79:63:55:7d:99:1c:
    61:e0:e9:f9:37:c4:35:2f:94:3c:a7:d7:ef:20:4d:
    7f:cd:5c:f2:51:31:20:83:b0:4f:23:5f:b7:26:ae:
    45:ad:f0:2d:08:12:ef:65:cc:ad:33:f3:08:d7:dc:
    5b:fc:9b:9f:8e:96:35:bb:be:db:7f:b5:47:b2:06:
```

Step 18. Encrypts the file **clear_message.txt** (from Task 1) into **rsa_ciphertext**, using the public key created earlier **public-key.pem**.

```
[ ]  1 !openssl pkeyutl -encrypt -in clear_message.txt -out rsa_ciphertext -inkey public-key.pem -pubin
```

Step 19. Verify that the **rsa_ciphertext** file was created.

```
[ ]  1 ls -la

total 48
drwxr-xr-x 1 root root 4096 May 23 02:49 ./
drwxr-xr-x 1 root root 4096 May 23 00:37 ../
-rw-r--r-- 1 root root   34 May 23 01:27 2_decrypt_message
-rw-r--r-- 1 root root   64 May 23 01:25 2_encrypted_message
-rw-r--r-- 1 root root   34 May 23 01:02 clear_message.txt
drwxr-xr-x 4 root root 4096 May 21 13:23 .config/
-rw-r--r-- 1 root root   34 May 23 01:08 decrypt_message.txt
-rw-r--r-- 1 root root   64 May 23 01:06 encrypted_message
-rw------- 1 root root 1704 May 23 02:40 private-key.pem
-rw-r--r-- 1 root root  451 May 23 02:41 public-key.pem
-rw-r--r-- 1 root root  256 May 23 02:49 rsa_ciphertext
drwxr-xr-x 1 root root 4096 May 21 13:23 sample_data/
```

Step 20. Read the contents of the **rsa_ciphertext file**.

```
[ ]  1 !cat rsa_ciphertext

fz
[illegible binary]
```

Step 21. Decrypt the **rsa_ciphertext** file with the private key **private-key.pem**, and obtain the **rsa_decrypt.txt file**.

```
!openssl pkeyutl -decrypt -in rsa_ciphertext -inkey private-key.pem
-out rsa_decrypt.txt
```

Step 22. Verify that the **rsa_decrypt.txt** file was created.

```
[ ]  1 ls -la

total 52
drwxr-xr-x 1 root root 4096 May 23 02:51 ./
drwxr-xr-x 1 root root 4096 May 23 00:37 ../
-rw-r--r-- 1 root root   34 May 23 01:27 2_decrypt_message
-rw-r--r-- 1 root root   64 May 23 01:25 2_encrypted_message
-rw-r--r-- 1 root root   34 May 23 01:02 clear_message.txt
drwxr-xr-x 4 root root 4096 May 21 13:23 .config/
-rw-r--r-- 1 root root   34 May 23 01:08 decrypt_message.txt
-rw-r--r-- 1 root root   64 May 23 01:06 encrypted_message
-rw------- 1 root root 1704 May 23 02:40 private-key.pem
-rw-r--r-- 1 root root  451 May 23 02:41 public-key.pem
-rw-r--r-- 1 root root  256 May 23 02:49 rsa_ciphertext
-rw-r--r-- 1 root root   34 May 23 02:51 rsa_decrypt.txt
drwxr-xr-x 1 root root 4096 May 21 13:23 sample_data/
```

Step 23. Use `cat` to read the contents of the **rsa_decrypt.txt file**.

```
1 !cat rsa_decrypt.txt

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```

Task 3. Certificates

Task 3.1

Step 24. Use `openssl` to generate a certificate signing request using:

```
!openssl req -new -nodes -newkey rsa:4096 -keyout key.pem -out cert.csr
```

Step 25. Write the solicitation options.

```
You are about to be asked to enter information that will be incorporated
into your certificate request.
What you are about to enter is what is called a Distinguished Name or a DN
There are quite a few fields but you can leave some blank
For some fields there will be a default value,
If you enter '.', the field will be left blank.
-----
Country Name (2 letter code) [AU]:MX
State or Province Name (full name) [Some-State]:CDMX
Locality Name (eg, city) []:BENITO JUAREZ
Organization Name (eg, company) [Internet Widgits Pty Ltd]:TRINITY CORP
Organizational Unit Name (eg, section) []:HACKING TEAM
Common Name (e.g. server FQDN or YOUR name) []:TRINITY
Email Address []:HACK@TRINITYCORP.HACK
```

Step 26. Verify that files "**cert.csr**" and "**key.pem**" were created.

```
1 ls -la

total 32
drwxr-xr-x 1 root root 4096 Jun  5 21:59 ./
drwxr-xr-x 1 root root 4096 Jun  5 20:32 ../
-rw-r--r-- 1 root root 1769 Jun  5 21:59 cert.csr
drwxr-xr-x 4 root root 4096 Jun  4 13:31 .config/
-rw------- 1 root root 3272 Jun  5 21:59 key.pem
```

Go to https://certstream.calidog.io/ and visualise in real time the new certificates created and signed.

Task 3.2 Self Signed Certificate

Step 27. Use `openssl` to create a self-signed certificate (**domain.crt**) without an existing private key and CSR.

```
!openssl x509 -signkey key.pem -in cert.csr -req -days 365 -out domain.crt
```

Step 28. Verify if the certificate request self-signed signature was successful.

```
1 !openssl x509 -signkey key.pem -in cert.csr -req -days 365 -out domain.crt
```

```
Certificate request self-signature ok
subject=C = MX, ST = CDMX, L = BENITO JUAREZ, O = TRINITY CORP, OU = HACKING TEAM, CN = TRINITY, emailAddress = HACK@TRINITYCORP.HACK
```

Step 29. Use openssl to open in plain text the certificate created.

```
!openssl req -text -in cert.csr -noout -verify
```

```
1 !openssl x509 -text -noout -in domain.crt
```

```
Certificate:
    Data:
        Version: 1 (0x0)
        Serial Number:
            55:50:88:d6:84:33:45:97:45:90:ff:b7:4a:8a:8f:57:50:f4:37:a3
        Signature Algorithm: sha256WithRSAEncryption
        Issuer: C = MX, ST = CDMX, L = BENITO JUAREZ, O = TRINITY CORP, OU = HACKING TEAM, CN = TRINITY, emailAddress = HACK@TRINITYCORP.HACK
        Validity
            Not Before: Jun  5 22:14:29 2024 GMT
            Not After : Jun  5 22:14:29 2025 GMT
        Subject: C = MX, ST = CDMX, L = BENITO JUAREZ, O = TRINITY CORP, OU = HACKING TEAM, CN = TRINITY, emailAddress = HACK@TRINITYCORP.HACK
        Subject Public Key Info:
            Public Key Algorithm: rsaEncryption
                Public-Key: (4096 bit)
                Modulus:
                    00:b8:ff:0a:3e:d8:20:06:e5:25:3d:27:45:d4:e4:
                    bc:29:25:61:a9:2d:1c:d3:6c:5d:cc:e2:b5:69:8b:
                    86:99:72:fe:22:f7:ca:db:42:99:1a:0b:e2:4c:08:
                    3f:a4:df:d2:26:fd:7e:0d:2e:70:2a:6f:7f:a5:78:
                    e5:48:e3:33:6c:c3:ca:ee:83:54:67:b5:3a:53:29:
```