MAT331 Exercises, Spring 2026

set number 9

32. *(expires Apr 22)* The text below was encrypted using a Vigenère cipher on the 28-letter alphabet consisting of the standard English alphabet, a space, and a period in that order (that is, "abcdefghijklmnopqrstuvwxyz ."). The keyword is known to be four characters long. Decrypt the message given below, and determine the encrypting keyword. You can find Maple for the Vignère cipher in this `worksheet`, and the encrypted text (with spaces unchanged) in `vignere4.txt`.

    The second two lines in the encrypted text begin with a space; linebreaks are not significant in the message. To make it easier to see the spaces, they have been written here as underscores (_).

    ```
    xvlfpbebud_ijxhw.tlxcq_wiv_ijgsw.guofpoi.wijii_fmjbbjh._pj
    _gppnruptdm._dcduw.wijii_fmjbc.ihh.hefpcdbsjlh.dfbgzgkupcovs
                _ltpyrvpdr.cow.iaolpaepjtbgzgkupcovs.
    ```

    Hint: As in the earlier problems, the message follows the rules of ordinary English, so spaces are quite common. Periods come at the end of sentences, so while they are not common, this can be a useful clue.

33. *(expires Apr 22)* Modify the implementation of the Vignère cipher as used in class (or in the worksheet `Crypto.mw`) to use the contents of a webpage for the keyphrase. That is, be able to encrypt some text with a command like `WebVignere(text,"https://www.math.stonybrook.edu/~mmovshev/mat331-spr2026/goldbug.txt")`. Be careful to account for the situation where the webpage may contain characters not in the `Alphabet`, and give an error if the URL can't be read (for example, if you use `http://example.com/nosuchurl` as your key). You should find the commands in the `HTTP` package useful.

34. *(expires Apr 22)* The string below was encrypted using an affine cipher on the 27-letter alphabet " abcdefghijklmnopqrstuvwxyz" (there is a space in the 0^{th} position.) Decrypt it.

    ```
    fmw segjaweoouanerj a ceyqrype aswaheoaqbrqabeafrua eeaojerf afmjeayperjpu
    ```

    Hint: this phrase follows the typical pattern in English where there are (almost) as many spaces as words (and so spaces are very common), and the letter "e" is also very common. You can use the technique described in section 7 of the cryptography chapter of the notes. In particular, using `msolve` should be helpful, and maybe `CharacterFrequencies` if you, like me, don't count so well.

    If you wish, the encrypted text can be loaded from the file `afftext.txt` . A version of the affine cipher can be found in the worksheet `Crypto.mw`, or you can write your own.

35. *(expires Apr 22)* The encrypted text below is a quote widely attributed to Albert Einstein (but probably not actually said by him).

    ```
    EINsteinc+eoplWcaewXoy.wNRjUkOeQaQQDARUzypyrmaFdnhZSdr-RaUzxpOvXc,Lv,1NLSTEINein
    ```

    The encrypted text can be found in the file `einsteincrypt.txt` . It was encrrypted using the `Affine` cipher from class (and from `Crypto.mw`), using an `Alphabet` which is 57 characters long, consisting of a space, the upper-case letters A–Z, a plus, the lower-case letters a–z, a comma, a period, and finally a hyphen. That is, (the first character is a space):

```
ABCDEFGHIJKLMNOPQRSTUVWXYZ+abcdefghijklmnopqrstuvwxyz,.-
```

The `Affine` cipher was used with blocks of eight letters at a time (that is, with `base=`57^8), and the name "Albert Einstein" appears in the plaintext (fortunately for you, it is in a convenient location, or this would be much harder). I believe `msolve` will be helpful. Note that "Albert Einstein" is 15 characters long, so you will have to guess one letter and the location of the name.

Decrypt the quotation.