

25. (*expires 4/3*) Historically, “pen and paper” encryption (that is, what was mostly done prior to about 1980) would first rewrite a message to be encrypted in all upper-case letters, omitting all punctuation and spaces, and then writing out the message in blocks of five letters. For example, the message `Mr. Watson, come here - I want to see you!` would be transcribed as `MRWAT SONCO MEHER EIWAN TTOSE EYOU` prior to encrypting. If the message was sufficiently long (longer than 50 characters or so), the blocks of letters would be continued on a new line.

Write a pair of Maple procedures to accomplish this goal (in slightly more general terms).

The first should take as input a string, convert all lower-case letters to upper case, and afterwards, remove any characters that are not in a global variable called `Alphabet`. For this, consider using `UpperCase` and `Select` from the `StringTools` package. The second procedure should print this out in a format as described above (blocks of 5 letters, separated by spaces). I suggest `printf` for this.

As usual, demonstrate that your routines work with some appropriate test cases, with at least one short message as above, and another message of perhaps 100 characters or so. Note that your routine should work with a variety of alphabets.

26. (*expires 4/3*) The encrypted text below is a quote from Albert Einstein:

```
EINsteinc+eoplWcaewXoy.wNRjUkOeQaQQDARUZypyrmaFdnhZSdr-RaUzxpOvXc,Lv,lNLSTEINein
```

The encrypted text can be found in the file [einsteincrypt.txt](#). It was encrypted using the `BigAffine` cipher we wrote in class (see the worksheet [Crypto.mw](#)). The alphabet used was 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 a hyphen. That is (the first character is a space):

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

`BigAffine` was used encrypting in blocks of eight letters at a time, and the name “Albert Einstein” appears in the plaintext (fortunately for you, it is in a convenient location, or this would be much harder).

Decrypt the quotation.

27. (*expires 4/3*) Modify the `BigAffine` cipher (see the worksheet [Crypto.mw](#)) so that instead of using a pair of large numbers a and b and a blocksize k as keys, these will be constructed from a passphrase, as follows.

First, split the passphrase into two halves (if the length of the phrase is odd, use the longer part to construct the shift b). Then, choose the blocksize k so that the passphrase can be represented as two large integers.

As an example, if the passphrase is “TSEliot”, and with the 57-character alphabet of the previous problem, we take $k = 4$, and use $a = 17348$ (corresponding to “TSE”) and $b = 8842620$ (corresponding to “liot”). The following passage (using the key “TSEliot” and separating each line by a space)

```
Let us go then, you and I,
When the evening is spread out against the sky
Like a patient etherized upon a table.
```

```
encrypts to      xzLscDvHXxIHyw.VzAnHbcINu-ND,oOsJwNCylgnRN,OR oSqAPseIV-J
                  g,Sbq,QJgiHyawtzPthAqInlnIvREUQlvEDyPjyyUoiq,WpbHvjvIzS
```

(In the above crypttext, ignore the newlines. There is only one space.)