Exercises: Frequency Analysis

Spreadsheet Exercise

In this section you will use a spreadsheet to aid you in conducting frequency analysis. To begin with download the spreadsheet `01b-frequency_analysis.xlsx`. You may want to look into the cells and see what functions are being used - some of them will have been used in the Caesar cipher spreadsheet and will be used in future weeks.

1. There is a piece of ciphertext in Cell `B1`. In Row 3, the individual ciphertext letters have been split up into separate boxes so that we can correct them back to plaintext.

2. In Rows 8-10, we can see the relative frequencies of letters that we would normally expect in the English language (Row 8), along with the relative frequencies of letters in the ciphertext (Row 10). Below this there is also a chart showing the relative frequencies side-by-side.

3. Use your knowledge from the lecture about frequencies of letters and common word/letter patterns to try and decipher this piece of ciphertext. To do this, enter guesses of how each letter have been encrypted in Row 14. It can be helpful to put capital letters in this row to distinguish them from plaintext letters. E.g., if you guess that the letter 'm' has been encrypted as 'Q', then underneath 'm' in Row 13, enter a 'Q' in Row 14.

4. Identify the source of the text.

The original ciphertext is given below to help find patterns in the text:

```
FL
TEI TFKI MS EDQUL IQ QDREFN TEIQI WDR FL ADCENDN D QFBE KIQBEDLT LDKIN
RFLNADN TEI RDFJMQ TEI RMUQBI MS WEMRI WIDJTE WDR D KYRTIQY FT RIIKIN
TM AI FLIXEDURTFAJI SMQ JMLC RIDRMLR EI HIOT MOIL EMURI DLN EFR ILTIQTDFLKILTR
WIQI TEI KMRT KDCLFSFBILT MS DJJ RDVI MLJY TEMRI MS IQ QDREFN EFKRIJS
DJJ TEDT QFBEIR BMUJN AUY RIIKIN DT EFR NFROMRDJ DLN EI JDVFREIN TEI
CMMN TEFLCR MS TEFR JFSI UOML EFR CUIRTR ODCIR RJDVIR DLN DTTILNDLTR
TEIQI WIQI FL CQIDT LUKAIQ EFR CDQNIL WDR RODBFMUR DLN AIDUTFSUJ DLN
EFR EMURI WDR SFJJIN WFTE IVIQY BMRTJY JUXUQY
TEFR RFLNADN TEI RDFJMQ EDR D RTMQY TM TIJJ TEI RTMQY MS EFR JFSI AUT
EI LIVIQ TMJN FT TM DLY ULTFJ MLI NDY TEIQI BDKI TM EFK MLI RFLNADN
TEI JDLNRKDL D KDL MS OMMQ DLN EUKAJI AFQTE TEFR KDL OJIDRIN EFK CQIDTJY
```

WFTE DL DOT QIBFTDTFML NIDJFLC WFTE TEI WFNIJY NFSSIQILT JMTR NFROILRIN
AY CMN TM KIL DLN AIFLC OJIDRIN EI WDR RTQUBH WFTE TEI EDOOY BMLBIFT
TEDT LMW RFLNADN TEI RDFJMQ WDR DT JDRT BMLSQMLTIN WFTE RFLNADN TEI
JDLNRKDL FT WMUJN AI LM ADN TEFLC WIQI EI TM LDQQDTI TEI RTMQY MS EFR
JFSI RM TEDT DJJ KFCET HLMW EFR RTQDLCI DNVILTUQIR DLN BMLGIBTUQI LM
JMLCIQ DR TM TEI RMUQBI MS EFR SDAUJMUR WIDJTE
DBBMQNFLCJY RFLNADN TEI RDFJMQ EIJN RIVIL QIBIOTFMLR ML RIVIL NFSSIQILT
NDYR DLN DJTEMUCE ML IDBE MBBDRFML D KUJTFTUNI MS CUIRTR WDR DRRIKAJIN
TM JFRTIL EI SDFJIN LMT TM DNNQIRR EFR WMQNR SQMK SFQRT TM JDRT TM
EFR RFKOJI JFRTILIQ RFLNADN TEI JDLNRKDL SMJJMWFLC FR EFR LDQQDTFML
MS TEI RTQDLCI DLN WMLNIQSUJ DNVILTUQIR EI IXOIQFILBIN FL EFR RIVIL
VMYDCIR

Exercises

1. The following message has been encrypted using a monoalphabetic cipher. Using your frequency analysis spreadsheet, break the code and read the message. Then identify the source of the text.
   VANA GH OPNRGTANO PH DHUA XHQ BGHV PLA NQDAO RGK OH KH E KH E
   R SQDD CHFFEPFAGPO VLRP EF PLEGBEGT HS XHQ VHQDKGP TAP PLEO SNHF
   RGX HPLAN TQX E YQOP VRGGR PADD XHQ LHV EF SAADEGT THPPR FRBA
   XHQ QGKANOPRGK GAUAN THGGR TEUA XHQ QJ GAUAN THGGR DAP XHQ KHVG
   GAUAN THGGR NQG RNHQGK RGK KAOANP XHQ GAUAN THGGR FRBA XHQ CNX
   GAUAN THGGR ORX THHKIXA GAUAN THGGR PADD R DEA RGK LQNP XHQ VAUA
   BGHVG ARCL HPLAN SHN OH DHGT XHQN LARNPO IAAG RCLEGT IQP XHQNA
   PHH OLX PH ORX EP ORX EP EGOEKA VA IHPL BGHV VLRPO IAAG THEGT
   HG THEGT HG
   VA BGHV PLA TRFA RGK VANA THGGR JDRX EP RGK ES XHQ ROB FA LHV
   EF SAADEGT KHGP PADD FA XHQNA PHH IDEGK PH OAA GAUAN THGGR TEUA
   XHQ QJ GAUAN THGGR DAP XHQ KHVG GAUAN THGGR NQG RNHQGK RGK KAOANP
   XHQ GAUAN THGGR FRBA XHQ CNX GAUAN THGGR ORX THHKIXA GAUAN THGGR
   PADD R DEA RGK LQNP XHQ GAUAN THGGR TEUA XHQ QJ GAUAN THGGR DAP
   XHQ KHVG GAUAN THGGR NQG RNHQGK RGK KAOANP XHQ GAUAN THGGR FRBA
   XHQ CNX GAUAN THGGR ORX THHKIXA GAUAN THGGR PADD R DEA RGK LQNP
   XHQ VAUA BGHVG ARCL HPLAN SHN OH DHGT XHQN LARNPO IAAG RCLEGT
   IQP XHQNA PHH OLX PH ORX EP PH ORX EP
2. The following message has been encrypted using a monoalphabetic cipher. Using your frequency analysis spreadsheet, break the code and read the message. Then identify the source of the text.
   ND IW DZ GDN ND IW NTLN HF NTW MUWFNHDG KTWNTWZ NHF GDISWZ HG
   NTW AHGR ND FUVVWZ NTW FSHGXF LGR LZZDKF DV DUNZLXWDUF VDZNUGW
   DZ ND NLJW LZAF LXLHGFN L FWL DV NZDUISWF LGR IB DQQDFHGX WGR
   NTWA ND RHW ND FSWWQ GD ADZW LGR IB L FSWWQ ND FLB KW WGR NTW
   TWLZNLPTW LGR NTW NTDUFLGR GLNUZLS FTDPJF NTLN VSWFT HF TWHZ ND
   HN HF L PDGFUAALNHDG RWEDUNSB ND IW KHFTWR ND RHW ND FSWWQ ND
   FSWWQ QWZPTLGPW ND RZWLA LB NTWZWF NTW ZUI VDZ HG NTLN FSWWQ DV
   RWLNT KTLN RZWLAF ALB PDAW KTWG KW TLEW FTUVVSWR DVV NTHF ADZNLS
   PDHS AUFN XHEW UF QLUFW NTWZWF NTW ZWFQWPN NTLN ALJWF PLSLAHNB
   DV FD SDGX SHVW VDZ KTD KDUSR IWLZ NTW KTHQF LGR FPDZGF DV NHAW

NTW DQQZWFFDZF KZDGX NTW QZDUR ALGF PDGNUAWSB NTW QLGXF DV RWFQHFWR
SDEW NTW SLKF RWSLB NTW HGFDSWGPW DV DVVHPW LGR NTW FQUZGF NTLN
QLNHWGN AWZHN DV NTW UGKDZNTB NLJWF KTWG TW THAFWSV AHXTN THF
MUHWNUF ALJW KHNT L ILZW IDRJHG KTD KDUSR VLZRWSF IWLZ ND XZUGN
LGR FKWLN UGRWZ L KWLZB SHVW IUN NTLN NTW RZWLR DV FDAWNTHGX LVNWZ
RWLNT NTW UGRHFPDEWZWR PDUGNZB VZDA KTDFW IDUZG GD NZLEWSSWZ ZWNUZGF
QUOOSWF NTW KHSS LGR ALJWF UF ZLNTWZ IWLZ NTDFW HSSF KW TLEW NTLG
VSB ND DNTWZF NTLN KW JGDK GDN DV NTUF PDGFPHWGPW RDWF ALJW PDKLZRF
DV UF LSS LGR NTUF NTW GLNHEW TUW DV ZWFDSUNHDG HF FHPJSHWR DEWZ
KHNT NTW QLSW PLFN DV NTDUXTN

3. The following message has been encrypted using a monoalphabetic cipher. Using your frequency analysis spreadsheet, break the code and read the message. Then identify the source of the text.

ZVGXSEZVPKQTIJXTIVJTCPXKOQKVUFZISXSUQSPQSXZVPGXKXJIPJZIALXJXKZTHKIHTVSPTVPIKIVLMZVTQS