LAB 3

Frequency analysis

EXPERIMENT 3.1. English frequency analysis.

(a) Create a new command:
```
LetterCounts[str_]:=Counts[Cases[Characters[ToLowerCase[str]], _?LetterQ]]
```
What does it do?

(b) Find a long piece of texts online. Use the following command to save its data: `a = Normal[ Sort[ LetterCounts[ your_text]]]`

(c) Repeat with two more so you also have variables b and c corresponding to two other pieces of text.

(d) Display all three using the command `TableForm[Transpose[{a,b,c}]]`. What do you notice?

PROBLEM 3.2. Use what you learned above to crack the following substitution cipher:

```
wx kop xzr grpx qs xwnrp, wx kop xzr kqvpx qs xwnrp, wx kop xzr
oar qs kwptqn, wx kop xzr oar qs sqqbwpzmrpp, wx kop xzr ryqcz qs
grbwrs, wx kop xzr ryqcz qs wmcvrtdbwxf, wx kop xzr propqm qs bwazx,
wx kop xzr propqm qs tovimrpp, wx kop xzr pyvwma qs zqyr, wx kop
xzr kwmxrv qs trpyowv, kr zot rlrvfxzwma grsqvr dp, kr zot mqxzwma
grsqvr dp, kr krvr obb aqwma twvrcx xq zrolrm, kr krvr obb aqwma
twvrcx xzr qxzrv kof--wm pzqvx, xzr yrvwqt kop pq sov bwir xzr yvrprmx
yrvwqt, xzox pqnr qs wxp mqwpwrpx odxzqvwxwrp wmpwpxrt qm wxp grwma
vrcrwlrt, sqv aqqt qv sqv rlwb, wm xzr pdyrvboxwlr travrr qs cqnyovwpqm
qmbf.
```

PROBLEM 3.3. Use what you learned above to crack the following substitution cipher:

```
gbsbm vzszg mmqmd czijl bgyjz savzg mdgbs sqlsm xgbst jiicl sjgzg
mmqmd jgzmw dcdqi mmhsq mvgmt sycky mcqzo yscqm xwszg pmvdg yfxcy
nicdq dmgcy sncyh ckisb mvzsk fcdfn scdzj gwczc kmvgg bjygf fscyz
miqzr vcggj zbzrv cyjzb ncqsm xkyjp hcdqb cqxmv ywjdq mwzzs gjdgb
sxymd gmxcz jescd qoymo mygjm dwbjp bnmys myisz zsucp gifxc jisqg
moisc zsgbs sfsgb smdif osyzm dxmyw bmngb sbmvz swczj dcdfw cfzos
pjciw czcyg bvyqs dgcdq gbcgw czmdi fkspc vzsjg bcoos dsqgm ksgbs
mdsbs ijtsq jdbsb cqijt sqjdj gxmyc kmvgg byssf scyzs tsyzj dpsbs
bcqnm tsqmv gmxim dqmdk spcvz sjgnc qsbjn dsytm vzcdq jyyjg ckisb
swczc kmvgg bjygf czwsi igcii qcyhb cjysq cdqds tsyrv jgscg sczsw
jgbbj nzsix gbsgb jdlgb cgvzs qgmwm yyfbj nnmzg wczgb sxcpg gbcgo
smois ciwcf zvzsq gmczh bjnwb cgbsw czimm hjdlz mwmyy jsqck mvgbs
wmyhs qjdim pciyc qjmwb jpbbs ciwcf zvzsq gmgsi ibjzx yjsdq zwczc
imgnm ysjdg syszg jdlgb cdgbs foymk ckifg bmvlb gjgwc zgmmn mzgmx
bjzxy jsdqz
wmyhs qjdcq tsygj zjdl
```

PROBLEM 3.4. Use what you learned above to crack the following substitution cipher:

```
AQJCP   KLLSL   QQVLJ   VPKFR   SMJDO   KBLKH   ?SQRV   HQMMO
KDJKE   ?JEK   AQFYO   KIJHF   YKCI.   JMQRL   AHDV   HQMMO
KDDQA   QMJDO   QHPJZ   JYKRF   ODJD!   SQRVH   QM,JX   RID,A
QDOJH   FI.DO   PEQUO   KIBLK   HI,DO   PYQBI   OKWPB   LKHI,
FQCAQ   HIFQ   DBLKH   I.SQR   VHQM,   DOPS   CPIYO   PEPCI   .IYOP
  EPCID   CSJHF   DQYQH   DCQLD   OPJCM   QCLAI   .JEH
QDKIY   OPEPC   .JDCS   DQIOQ   MDOPI   YOPEP   CIOQM   ,BKDO
PDJY,   DOPJC   KDDPE   BDIDQ   YQHDC   QLDOJ   HFICP   KLLSK
CP.IQ   ,MOPH   JIKS,   KO,YQ   EPOPC   P,MOP   HJIKS   DOKDS
QRKHA   SQRCF   JCLZC   JPHAM   KIHQD   OJHFB   PCIQH   KL,SQ
RVHQM   DOKDJ   EDPL   LJHFD   OPDCR   DO.JD   IDOP   IYOPE   PCIDO
  KDBRD   SQRMO   PCPSQ   RKCP.   SQRMP   CPKIY   OPEPC
,SQRO   KABLK   HI,KH   ARO,L   QQVMO   PCPDO   KDFQD   SQR.J
XRIDA   JAMOK   DJAQU   PID.J   DQQVS   QRCBL   KHKHA   JDRCH
PAJDQ   HJDIP   LZ.LQ   QVMOK   DJAJA   ,DQDO   JIYJD   SMJDO
KZPMA   CREIQ   ZFKIK   HAKYQ   RBLPQ   ZURLL   PDI.O   E?SQR
VHQMM   OKD,S   QRVHQ   MMOKD   JHQDJ   YPA?H   QUQAS   BKHJY
IMOPH   DOJHF   IFQKY   YQCAJ   HFDQB   LKH.P   WPHJZ   DOPBL
KHJIO   QCCJZ   SJHF.   JZDQE   QCCQM   JDPLL   DOPBC   PIIDO
KDLJV   PKFKH   FUKHF   PC,MJ   LLFPD   IOQD,   QCKDC   RYVLQ
KAQZI   QLAJP   CIMJL   LUPUL   QMHRB   ,HQUQ   ASBKH   JYI,U
PYKRI   PJDI   KLL,B   KCDQZ   DOPBL   KH.UR   DMOPH   JIKSD
OKDQH   P,LJD   DLPQL   AEKSQ   CMJLL   AJP,M   PLLDO   PHPWP
CSQHP   LQIPI   DOPJC   EJHAI!
```