

LAB 1

Cracking codes

EXPERIMENT 1.1. Open Mathematica, compute $2+2$, and write down the answer. Hint: Shift+Enter or Shift+Return.

EXPERIMENT 1.2. Try out the `StringReplace` command:

- What does `StringReplace["asdf", {"a"->"b"}]` do?
- Why doesn't `StringReplace["asdf", {"S"->"B"}]` change anything?
- How can you use the previous answer to help you decode an all-caps ciphertext?
- How do you change two values of two different letters?

PROBLEM 1.3. Use `StringReplace` to decode the following text encoded with a Caesar cipher.

QNaN RB SJVNB QNWAH CAXCCNA FQNW QN FJB JKXDC OXDA HNJAB XUM.
DY DWCRU CQRB CRVN, QN QJM QJM J QJYYH URON, URERWP YNJLNODUUH FRCQ
QRB VXCQNA JWM OJCQNA RW J KNJDCRODU QXDBN KNBRMN CQN BNJ. CQNaN
FNAN JUFJHB YUNWCH XO XCQNA LQRUMANW OXA QRV CX YUJH FRCQ, JWM CQNaN
FJB J BJWMH KNJLQ OXA QRV CX ADW JKXDC XW, JWM CQN XLNJW CX YJMMUN
RW. RC FJB CQN YNAONLC URON OXA J BVJUJ KXH.

- Write down the author of the text.
- Write down the decoding formula for the cipher, without using the minus sign.
- Write down the encoding formula for the cipher.

An affine (rhymes with “line”) cipher uses an encoding function of the form $y = ax + b$, where a and b are integers. When $a = 1$, an affine cipher turns into a Caesar cipher, with a shift of b .

PROBLEM 1.4. Use `StringReplace` to decode the following text encoded with an affine cipher.

L HBEG GN XMBBW HLG C VZ TPV LE VZ VNPGC RES ENH GCBOBX TPV LE VZ CRL O.

- (a) Write down the author of the text.

- (b) Write down the decoding formula for the cipher (hint: a miracle happens).

- (c) Write down the encoding formula for the cipher (hint: use weird algebra).

PROBLEM 1.5. Use `StringReplace` to decode the following text encoded with a substitution cipher.

THJFN ITY ENCJRRJRC BM CNB DNKS BJKNO ML YJBBJRC ES WNK YJYBNK MR BWN ETRA, TRO ML WTDJRC RMBWJRC BM OM: MRFN MK BIJFN YWN WTO VNNVNO JRBM BWN EMMA WNK YJYBNK ITY KNT OJRC, EZB JB WTO RM VJFBZKNY MK FMRDNKYTBJMRY JR JB, TRO IWTB JY BWN ZYN ML T EMMA, BWMZCW THJFN, IJBWMBZB VJFBZKNY MK FMRDNKYTBJMRY?

YM YWN ITY FMRYJONKJRC, JR WNK MIR GJRO (TY INHH TY YWN FMZHO, LMK BWN WMB OTS GTON WNK LNNH DNKS YHNNVS TRO YBZVJO), IWNBWNK BWN VHNTYZKN ML GTAJRC T OTJYS-FWTJR IMZHO EN IMKBW BWN BKMZEHN ML CNBBJRC ZV TRO VJFAJRC BWN OTJYJNY, IWNR YZONRHS T IWJBN KTEEJB IJBW VJRA NSNY KTR FHMYN ES WNK.

- (a) Write down the author of the text.