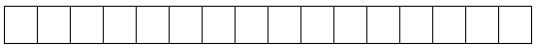
**Problem 1.** *Here's the ASCII chart again (notice that it's base-16).*

**ASCII Chart**

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | NUL | SOH | STX | ETX | EOT | ENQ | ACK | BEL | BS | HT | LF | VT | FF | CR | SO | SI |
| 1 | DLE | DC1 | DC2 | DC3 | DC4 | NAK | SYN | ETB | CAN | EM | SUB | ESC | FS | GS | RS | US |
| 2 | SP | ! | " | # | $ | % | & | ' | ( | ) | * | + | , | - | . | / |
| 3 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | : | ; | < | = | > | ? |
| 4 | @ | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
| 5 | P | Q | R | S | T | U | V | W | X | Y | Z | [ | \ | ] | ^ | _ |
| 6 | ` | a | b | c | d | e | f | g | h | i | j | k | l | m | n | o |
| 7 | p | q | r | s | t | u | v | w | x | y | z | { | \| | } | ~ | DEL |

*(a) How would the word "Ok" actually be stored in computer memory? Answer by shading in some of the following boxes:*



*(b) What characters are encoded below?*

**Problem 2.** *Decode the message written in Caesar cipher (warning: it's in Latin).*

*HW WX EUXWH*

**Problem 3.** *The following was encoded using a shift cipher. Guess the shift and decode the message.*

*B TIJGU DJQIFS*

**Problem 4.** *Use a 2-letter shift cipher to encode "hello world".*

**Problem 5.** *Read the following:*

> Another old encryption scheme consists of writing backwards.For example,
> some of Leonardo daVinci's notes are written backwards, probably so others
> would have trouble reading them. And then there's the "boustrophedon"
> way of writing, which literally means "ox-turning", which was sometimes
> used in Ancient Greece — and in this paragraph.

**Problem 6.** *Completely factor the following numbers into primes:*

*(a)* 24

*(b)* 385

*(c)* 223

**Problem 7.** *Use the Sieve of Aristothenes to find all the primes between 90 and 100.*

**Problem 8.** *Suppose you are sending the number 791931.*

*(a) Compute the basic checksum.*

*(b) Compute the* $1-3-1-3$ *checksum.*

**Problem 9.** *Most credit cards implement the Luhn Algorithm (patented in 1960), which works as follows (let's use the example 4485723586944236):*

1. *Remove the last digit, which is the checksum (6, leaving 448572358694423).*
2. *Double every other remaining digit (8,4,16,5,14,2,6,5,16,6,18,4,8,2,6).*
3. *Add up all the* digits *(*$8+4+1+6+5+1+4+2+6+5+1+6+6+1+8+4+8+2+6=84$*).*
4. *Take the last digit of your sum (*4*) and subtract it from 10 (*6*). That is the checksum from 1.*

*Are the following valid credit card numbers?*

*(a) 4929085163644314*

*(b) 5143982419828804*