DATA REPRESENTATION

POSITIONAL NUMBER SYSTEMS

- Positional numbers can use any number as a base

- Given a base, b, distinct symbols must be used to represent the numbers 0, 1,..., b-1

  For base 10 we use the 10 symbols
  0, 1, 2, 3, 4, 5, 6, 7, 8, 9

  For binary (base 2) we use the 2 symbols 0 and 1

  For octal (base 8) we use the 8 symbols 0, 1, 2, 3, 4, 5, 6, 7

  For hex (base 16) we use the 16 symbols 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F

  No reason that we can't also use base 7 or 19 but they're obviously not very useful

- Numbers are deciphered from right to left

  Number positions by assigning 0 to the rightmost position in the number and and increasing the number of the position by 1 as you number the positions from right to left

  The character at position k determines how many b^k (b raised to the k-th power) units are present

  Recall that b^0 is 1 for all b

  The restriction is that only the symbols for 0,..,b-1 may appear in each position of the number

- For example, in base 16, $347_{16} = 768 + 48 + 7 = 839_{10}$

3	4	7
$3 * 16^2 = 3 * 256$	$4 * 16^1 = 4 * 16$	$7 * 16^0$
768	48	7

- In base 8, $347_8 = 192 + 32 + 7 = 231_{10}$

3	4	7
$3 * 8^2 = 3 * 64$	$4 * 8^1 = 4 * 8$	$7 * 8^0$
192	32	7