Problem Set 1

1.1

a)

X		P(X)
2:	(1,1)	1/9
3:	(1,2) | (2,1)	2/9
4	(1,3) | (3,1) | (2,2)	1/3
5	(2,3) | (3,2)	2/9
6	(3,3)	1/9

b) $L(C^4) = \frac{1}{9} \cdot 1 + \frac{2}{9} \cdot 1 + \frac{3}{9} \cdot 2 + \frac{2}{9} \cdot 2 + \frac{1}{9} \cdot 3$

$= \frac{1}{9} + \frac{6}{9} + \frac{4}{9} + \frac{3}{9}$

$= \frac{16}{9} = 1\frac{7}{9}$

...

c) Because C^2 is not prefix-free.

d) C^3, C^4

e) Assume being at the start of a sequence. Then find the longer code which is a prefix from this sequence. Then we decode this part and are at the start of the next code word. (code word ✓ in the)

Proof by contradiction:

- Assume the „true" code word was longer
  ↯ since we chose longer

— shorter, then c would be prefix of c_i, thus not prefix-free ↯

- same different part, ↯ by assumption
- different, codebook is unique

// It is „suffix"-free, could just start from back.²

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