Exercise Huffman Coding I

Q: a) conditions for m and n.

$m+n = 1 - 0.15 - 0.1 - 0.08 - 0.06 - 0.05 - 0.02$

$m+n = 0.54$

average number of bits / symbol

$2m + 3x(n + 0.15 + 0.1 + 0.08 + 0.08) + 4x(0.05 + 0.02)$

$= 2m + 3(n + 0.39) + 0.28 < 2.86$

$2m + 3n < 1.41$

$n = 0.54 - m$

$2m + 3(0.54 - m) < 1.41$

$-m < 1.41 - 3 \times 0.54$

$m > 0.21$

$0.21 < m < 0.54$

$0 \leq n < 0.33$

(b) $m = 0.3$ $n = 0.24$ effectiveness optimal?

average number of bits / symbol

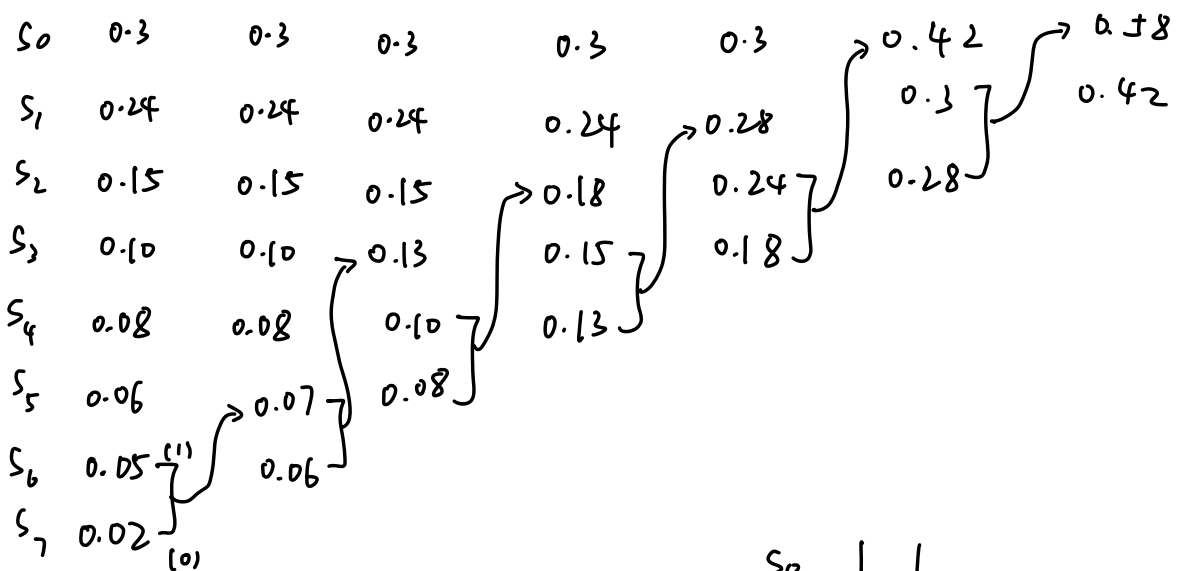
$2 \times 0.3 + 3(0.24 + 0.39) + 0.28 = 2.77$

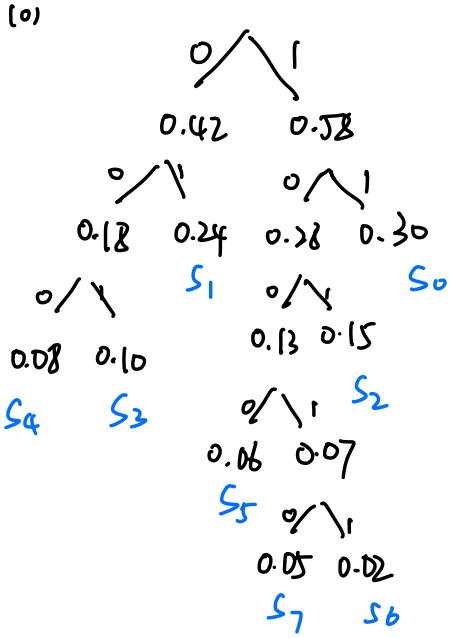
if use unvariance code, it need $\log_2 8 = 3$ bits/symbol

codebook A has effectiveness

larger probabilities corresponds to shorter codewords

Huffman code





S_0	1	1					
S_1	0	1					
S_2	1	0	1				
S_3	0	0	1				
S_4	0	0	0				
S_5	1	0	0	0			
S_6	1	0	0	0	1		
S_7	1	0	0	0	0		

average number of bits/symbol

$2\times(0.3+0.24)+3\times(0.15+0.10+0.08)+4\times0.06+5\times(0.05+0.02)$

$= 2.66 < 2.77$

So codebook A isn't optimal