1

Symbol	*Encoding*
A	0
B	01
C	10
D	1

With the variable-length binary code above, what is the string "001" an encoding of?

1. AB
2. CD
3. AAD
4. Not enough information to answer

(4) is the correct answer. This is example of why it is necessary to have prefix-free encoding, we can't tell what is the proper way to decode since multiple keys could have the same prefix.

2

Symbol	*Encoding*
A	0
B	10
C	110
D	111

Symbol	*Frequency*
A	60%
B	25%
C	10%
D	5%

What is the average number of bits per symbol used by the variable-length code above?

1. 1.5
2. 1.55
3. 2
4. 2.5

(2) is the correct answer $.1 \cdot 6 + .25 \cdot 2 + .1 \cdot 3 + .05 \cdot 3 = 1.55$.