L27Q1  Stereo audio is sampled at 44.1 kHz and quantized to 16 bits/channel and then compressed to 128 kbps mp3 playback format. What are the approximate DCR and the resulting savings?

L27Q2  A picture of a samurai was saved as a 24-bit samurai.bmp (full size, 2188 kB) and a 31 kB samurai.png. Estimate the DCR and savings from the PNG compression.

L27Q3  Why was the cartoon samurai picture highly compressible?

L27Q4  Can we expect to achieve such DCR with the photograph?

L27Q5  What was the relative frequency (probability) of someone ordering the menu’s #1 sandwich selection (we call this \( p_1 \))? 

L27Q6  What is the fewest number of bits needed to encode each of 8 possible orders with a unique (and unambiguous) bit sequence of equal length for each?

L27Q7  What is the entropy of one order given the popularity statistics above?

L27Q8  Create a Huffman tree based on the order statistics given above.

L27Q9  Complete the table above with Huffman codes from the tree above.

\[
\begin{array}{cccc}
\#1 & \#2 & \#3 & \#4 & \#5 \\
18 & 9 & 8 & 10 & 5 \\
11 & 00 & 101 & 01 & 100 \\
\end{array}
\]

L27Q10  Which menu items does not appear in the sequence 1110001010100?

L27Q11  What is the average bit length per sandwich order?

L27Q12  How does the average bit length compare to entropy?