

# Hints for exercises for Monday, second hour

Mathias Winther Madsen  
mathias.winther@gmail.com

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## Entropy of a categorical variable

1.  $H(X) = 1 + \frac{3}{4} \log 3 \approx 2.19$ .
2. You should get codewords of lengths  $k = 3, 3, 2, 2, 2$ .
3. Your answer depends on where you put the 0s and 1s.

## Huffman tree for a die

1. You should get codewords of lengths  $k = 2, 2, 3, 3, 3, 3$ .
2. You should get  $\frac{8}{3} \approx 2.67$ ; if not, check that you have been using the right weights. The entropy is  $H(X) = \log 6 \approx 2.58$ .
3.  $\frac{1}{4}, \frac{1}{4}, \frac{1}{8}, \frac{1}{8}, \frac{1}{8}, \frac{1}{8}$ .

**Age order (McKay, Exercise 2.35)** Write down the complete set of possibilities before you do anything.

**Knights and Knaves (McKay, Exercise 2.37)** Draw up a  $2 \times 2$  table.

**Shuffling cards (McKay, Exercise 6.19)** Use Stirling's approximation, use a computer to add up a list of logarithms, or be clever about adding up prime factors.