

A roulette spin has 38 equiprobable outcomes. The entropy of this event is

$$H\left(\frac{1}{38}, \frac{1}{38}, \dots, \frac{1}{38}\right) = \log_2 38 \approx 5.2479 \text{ bits}$$

If we derive a code as balanced as possible that is *minimal for instantaneousness*, we obtain a code in which 26 symbols have the length 5, and 12 symbols have the length 6:

$$26 \cdot \frac{1}{2^5} + 12 \cdot \frac{1}{2^6} = 1$$

The average length of this code is

$$\frac{26 \cdot 5 + 12 \cdot 6}{38} \approx 5.3158 \text{ bits}$$

which is ≈ 0.068 bits higher than the theoretical entropy.