

Part 2 – The Solution - Answers**Solution 1**

$$H(0.499, 0.501) = -(0.499 \log_2 0.499 + 0.501 \log_2 0.501) = 0.999997$$

Solution 2

$$\begin{aligned} H\left(\frac{1}{n}, \dots, \frac{1}{n}\right) &= -\left(\frac{1}{n} \log_2 \frac{1}{n} + \dots + \frac{1}{n} \log_2 \frac{1}{n}\right) = -n \frac{1}{n} \log_2 \frac{1}{n} = -\log_2 \frac{1}{n} \\ &= \log_2 n \end{aligned}$$

Solution 3

If only one event can occur then its probability is 1, and the entropy is:

$$H(1) = -1 \log_2 \frac{1}{1} = 0$$

We know the event must happen, because its probability is 1. There is no information in knowing something we already know.

Solution 4

$$H(0.5, 0.5) = -(0.5 \log_2 0.5 + 0.5 \log_2 0.5) = -\log_2 0.5 = \log_2 2 = 1$$

The amount of information in a bit is 1. Choosing the logarithm to the base of 2, makes the bit a unit of information.