LE1.2.1: Entropy

pontos 3 / 3 (sem classificação)

Please compute the entropy associated with each the following random variables. You may find it helpful to use the built-in calculator -- click the icon in the lower righthand corner of the page. It supports the function "log2(...)" which computes the log-base-2 of its argument. You can type in an entire expression to evaluate, e.g., ".3*log2(1/.3) + .7*log2(1/.7)". Answers that include decimal places must be within 10% of the correct solution to be marked correct.

A) The flip of an unfair coin, where $p\left(\text{heads}\right) = 0.999$ and $p\left(\text{tails}\right) = 0.001$.

Entropy (in bits): 0.0114077 ✔ Answer: .0114

Explanation

Entropy = $p\left(\text{heads}\right) \cdot \log_2\left(\frac{1}{p(\text{heads})}\right) + p\left(\text{tails}\right) \cdot \log_2\left(\frac{1}{p(\text{tails})}\right)$

= 0.999*log2(1/.999) + 0.001*log2(1/.001) = .0114

B) The random choice of one of the 16 hex digits, where the probability of choosing any particular digit is $1/16$.

Entropy (in bits): 4 ✔ Answer: 4

Explanation

Entropy = $\sum_{i=0}^{15} p_i \cdot \log_2\left(\frac{1}{p_i}\right)$

= $\frac{1}{16} * log2\left(\frac{1}{\frac{1}{16}}\right) + \frac{1}{16} * log2\left(\frac{1}{\frac{1}{16}}\right) + \ldots + \frac{1}{16} * log2\left(\frac{1}{\frac{1}{16}}\right)$

= $16 * \frac{1}{16} * log2\left(16\right) = 4$

C) The quiz grade of a randomly-chosen student, where in the 100-student class the grade distribution was 27 A's, 38 B's, 23 C's, 8 D's, and 4 F's.

Entropy (in bits): 2.0054 ✔ Answer: 2.005

Explanation

Entropy = 0.27*log2(100/27) + 0.38*log2(100/38) + 0.23*log2(100/23) + 0.08*log2(100/8) + 0.04*log2(100/4)

Enviar

Answers are displayed within the problem

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[typo] missing word "each the following", should be "each of the following" #typo	1
B outcome. ha. B got me. listen to my better judgement :)	5
2 bits are sufficient for question (C)??? we have five grades, So we require 3 bits to represent 5 grades i.e 000 for A,001 for B,010 for C,01...	2
Shannon's Information Formula Not Intuitive For an unfair coin flip, where p(heads) = 0.999 and p(tail)=0.001 and the coin is flipped once, If I w...	11
Computational Power Tremendous computational power of the calculator at the bottom of the page. With this computati...	1