Lab W1D4

Question 1.

An ***array*** of size 100000000000 is filled with four different letters A, B, C and D. Assume that all four letters are equally likely to appear in the array S. However, there is no guarantee that all four letters are in the array.

(a) What is the average number of array locations to inspect to find the first D? Give your answer using a formula or result mentioned in the class note. Please give the Slide number as a reference.
(b) What is the average number of array locations to inspect to find 10 D's? Give your answer using a formula or result mentioned in the class note. Please give the Slide number as a reference.
(c) What is the "average time complexity" to find **k** D's in an array?

Question 2.

Prove: $1 + 1/2 + 1/3 + \ldots + 1/n = O(\log n)$.

Hint:

Let n = **7**

$1 + 1/2 + 1/3 + 1/4 + 1/5 + 1/6 + 1/7 <= 1 + 1/2 + 1/2 + 1/4 + 1/4 + 1/4 + 1/4 = 3 = \log(7 + 1)$

Question 3.

Find the sum: $1/2 + 2/4 + 3/8 + 4/16 + 5/32 + \ldots$

Hint:

$S = 1/2 + 2/4 + 3/8 + 4/16 + 5/32 + \ldots$

$S/2 = 1/4 + 2/8 + 3/16 + 4/32 + \ldots$

$S - S/2 = 1/2 + 1/4 + 1/8 + 1/16 + 1/32 + \ldots$