Recitation - 05

CS2040S Recitation Team

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Problem

You have a function $rand5()$ that generates a random integer from 1 to 5. Use it to write a function $rand7()$ that generates a random integer from 1 to 7. Comment on your proposed approach whether it will end in a number of calls to the function, $rand5()$ or not.

Solution

Assume we are generating a number A as $A = (rand5() - 1) + 5 * (rand5() - 1)$. A will take uniform values from 0 to 24. We can do this again and again until $A < 21$. Then we can return $rand7() = A\%7 + 1$. We have to generate A, E_n times to get a value which is less than 21.

$$\begin{aligned} E_n &= \frac{21}{25} \times 1 + \frac{4}{25} \times (E_n + 1) \\ E_n &= 25/21 \\ &\approx 1.19 \end{aligned} \tag{1}$$

With a very small probability, we might generate number A infinite number of times.[1]

[1] Check whether this can be eliminated by tracking the numbers which are generated which are ≥ 21.