Assignment 2

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Exercise 1.8

The probability of picking a marble out of the bag and getting red is 0.9, and we are looking for the probability that we sample 10 random marbles and get 1 or 0 red marbles.

The probability of getting 0 red marbles is $(.1)^{10} = 10^{-10}$, and the probability of getting 1 red marble is $(.1)^9 * .9 * 10$, because we pulled 9 green marbles (with probability .1) and 1 red marble (probability .9), and there were 10 ways to do that.

The probability of doing either of those things is the sum of those two probabilities is $\mathbf{9.1 * 10^{-9}}$

Exercise 1.9

Using Hoeffding's Inequality, $\mu = .9$. Since we're looking for $v \leq .1$, $\epsilon \geq .9 - .1 = .8$. By definition, also, $N = 10$.

$$\begin{aligned} P[|v - \mu| \geq \epsilon] &\leq 2e^{-2\epsilon^2 N} \\ &\leq 2e^{-2*.8^2*10} \\ &\leq \mathbf{5.52 * 10^{-6}} \end{aligned}$$

Exercise 1.10

(a) After running the experiment a single time, μ for $v_0 = \mathbf{0.3}$, μ for $v_{rand} = \mathbf{0.5}$ and μ for $v_{min} = \mathbf{0}$