

Shifting the variance

We know that

$$\mathbb{E}[aX + c] = a\mathbb{E}[X] + c$$

What happens with variance?

i.e., What is $\text{Var}(aX + c)$? What is $\text{Var}(aX)$?

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Practice

Your music teacher requires you to play a 1000 note song without mistake. You have been practicing, so you have probability of 0.999 of getting each note correct (independent of the others). If you mess up a single note, you must start over and play from the beginning. Let X be the number of times you have to play the song from the start. What is $\mathbb{E}[X]$?

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Activity

More generally, run independent trials with probability p . How many trials do you need for r successes?

What's the pmf?

What's the expectation and variance? (hint: linearity)

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