META

Random Variables, Conditional Probability, Distributions

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1   General Comments

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1. There is only one conditional probability question with four parts, the first three parts are mandatory, but the last one is optional. It will still take a good chunk of time though, be ready for that.

2. For expectation and variance, all of the first problem in 3.1 are mandatory. Beyond that, for 2, 3, and 4, go through those in order finishing as many as you can.

3. Conditional Probability

   - Make sure that your students are definitely confident with Bayes Rule and the Product Rule before continuing.

   - Emphasize that conditioning is really just changing the probability space that events are drawn from

   - Can connect to normalization, i.e. want probability of all still relevant events to sum to 1, so divide by the total probability of the conditioned events

   - Show how independence decouples conditional probabilities i.e. $P(X|Y)^X \perp Y \rightarrow P(X|Y) = P(X)$

   - Basically this is saying that having Y gives no information about X, which is exactly what the above equation says.

4. Expectation/Random Variables

   - Talk about how RVs are functions of events to real numbers

   - Why do we need random variables?

   - Describe how functions of RVs are also RVs (e.g. $X + Y = Z$)

- Make sure that you write out the formal definition of expectation, it makes defining $E[X^2]$ much easier to show.

- Show how to do $E[f(X)]$ for a function f

- Do the proof for linearity of expectation

- Definitely do the True/False question

5. Variance

- Make sure that students are comfortable with calculating $E[X^2]$.

- Emphasize non-linearity

- Do the proof for why you need independence for splitting apart products