

## *Stat 134: Section 6*

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### *Conceptual Review*

Please discuss these short questions with those around you in section. These problems are intended to highlight concepts from lecture that will be relevant for today's problems.

- a. What is a random variable? And the joint distribution of two random variables? How can you obtain the marginal distribution of  $X$  from the joint of  $(X, Y)$ ?
- b. What is  $\mathbb{E}(X)$ ?

### *Problem 1*

Let  $X$  and  $Y$  be independent, each uniformly distributed on  $\{1, 2, \dots, n\}$ .

Find:

- a.  $P(X = Y)$ ;
- b.  $P(X < Y)$ ;
- c.  $P(X > Y)$ ;
- d.  $P(\max(X, Y) = k)$  for  $1 \leq k \leq n$ ;
- e.  $P(\min(X, Y) = k)$  for  $1 \leq k \leq n$ ;
- f.  $P(X + Y = k)$  for  $2 \leq k \leq 2n$ .

*Ex 3.1.15 in Pitman's Probability*

*Problem 2*

Suppose the Stat department teaches 15 classes a semester: 2 have 60 students, 1 has 300 students, and 12 have 20 students. Each course is taught by a different professor, and each student only takes one class in the department.

- a. For a randomly selected professor, what is the expected size of the class they teach?
- b. For a randomly selected student, what is the expected size of the class they are in? How does this compare to part (a)?

*Problem 3*

Draw five cards from a standard deck of cards to form a poker hand. Let  $E$  be the event of having no point. Find  $P(E)$ .

Instead of subtracting the sum of probabilities of getting points, try to think how you can approach this directly.

Hint: For a poker hand to receive no point, they have to be all singles, but not a straight or flush.