Lecture 3.1

Samples spaces w/ equally likely outcomes

PURDUE UNIVERSITY
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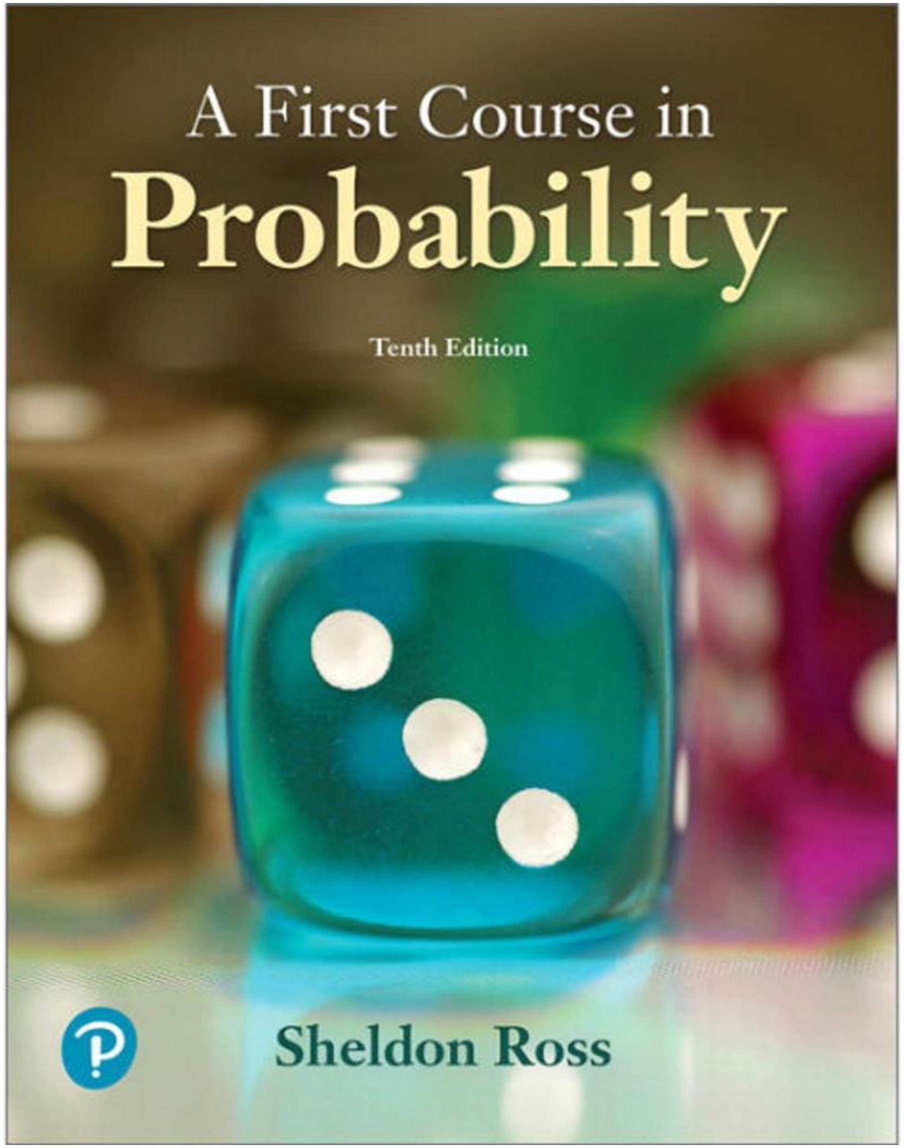


Today's reading: 2.5+2.7

Reading for *Friday* class: 3.1+3.2

MA/STAT 416 Help Room is <u>NOW OPEN!</u>

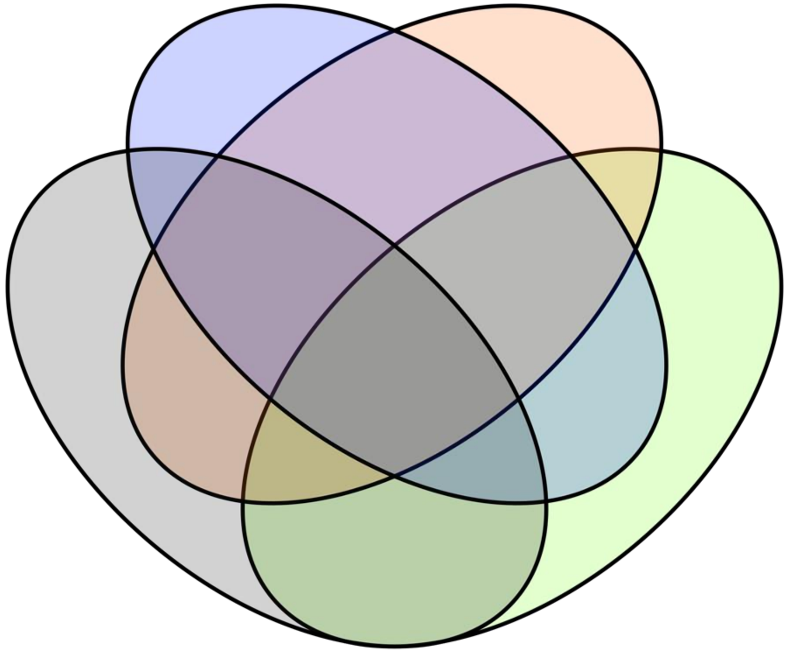
HW2 is due Friday at beginning of class.

Today's draft problem

To be presented by today's draftee.

1. Unpack the inclusion-exclusion identity in the case $n = 4$. That is, determine the explicit formula for $P(E_1 \cup E_2 \cup E_3 \cup E_4)$.

2. Prove that for any probability measure P on any sample space S, we have
$$P(\emptyset) = 0.$$



Sample spaces having equally likely outcomes

Let S be a *finite* sample space, which we might as well assume looks like:

$$S = \{1,2, \dots , N\}.$$

It is often natural to consider an experiment where each individual outcome in S has the same probability. That is, it is often natural to consider the probability measure P where:

$$P(\{1\}) = P(\{2\}) = \cdots = P(\{N\}).$$

Axioms 2 and 3 of probability then imply that we must have

$$P(\{1\}) = P(\{2\}) = \cdots = P(\{N\}) = \frac{1}{N}$$

(Why?)

We sometimes call this P the <u>*uniform probability measure*</u> on S.

Sample spaces having equally likely outcomes

If P is the uniform probability measure on $S = \{1, 2, \dots, N\}$ and $E \subset S$ is an event containing i outcomes, then

$$P(E) = \frac{i}{N}$$

(Why?)

THIS BASIC TYPE OF SCENARIO IS WHY WE SPENT SO MUCH TIME DOING COMBINATORICS THE FIRST WEEK OF CLASS

We’re going to spend the rest of today and Wednesday doing examples illustrating it.

Wedneday's draft problem

To be presented by Wednesday's draftee at the beginning of class.

Determine the probabilities of each of the following hands in 5 card poker:

a) Straight flush (5 of same suit that are *also* sequential)

b) Straight (5 sequential, but *not* all same suit)

c) Flush (5 of same suit, but *not* sequential)

Show your work! (Hint: use your result in part (a) to do parts (b) and (c).)