

## STAT 134: Section 1

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WELCOME TO STAT 134! Alongside lecture, discussion sections are a key way to clarify and reinforce the course content. We hope to make discussions an engaging and welcoming environment!

### Conceptual Review

Please discuss these short questions. These problems are intended to highlight concepts that will be relevant for today's problems.

- What is an outcome space (typically denoted by  $\Omega$ )?
- What is an event?
- What are the three axioms of probability?

### Set Operations Review

Consider an outcome space  $\Omega$ , and two events  $A, B \subset \Omega$ . In each of the parts below, fill in the blanks with either an event, or  $\cup$  or  $\cap$  symbols so that the equalities hold. (It may help to draw Venn diagrams.)

Think about how these operations can be used to manipulate the probabilities of events.

- Partitioning:  $A = (A \text{ _____ } B) \text{ _____ } (A \text{ _____ } B^c)$
- DeMorgan's Law I:  $(A \cap B)^c = A^c \text{ _____ } B^c$
- DeMorgan's Law II:  $(A \cup B)^c = A^c \text{ _____ } B^c$
- Suppose  $B \subset A$ . Then  $A \cap B = \text{_____}$ .

## *The Birthday Problem*

CLASS ACTIVITY: In your discussion section, how many students do you think have the same birthday? As time permits, your GSI will write down your birthdays to see how many shared birthdays there are.

Suppose you are in a classroom of  $n$  students ( $n \leq 365$ ). In the following calculations, ignore leap days and assume that students' birthdays are independent and distributed uniformly at random across the year.

- a. Find the chance that at least one other student shares *your* birthday.
- b. Find the chance that at least two students share the same birthday.
- c. Using your answer from part (b), derive a useful approximation for this expression, using the approximation  $\log(1 + x) \approx x$  for small  $x$ .

How are these assumptions violated in reality? How does this affect the true probability of these events?

*From Section 1.6, Example 5 (pg 62) in Pitman's Probability*