Notes for Feb 7 Tutorial

The exercise involving Hershey's kisses is CANCELLED. Remaining stock is on my desk in 203.

There are four topics and an optional time sink:

- Team building.
- Probability discussion.
- Best-of-five.
- GPA weirdness.
- Strange coins.

1 Team Building

- Ask students for name, home town, living group, and some nontechnical fact about them.
- For students who have a hard time giving an additional fact, prompt with: interesting place visited? Hobby? Sport played? Musical instrument? Most embarassing episode?
- Ask a followup question about anything that intrigues you; this shows that you're listening and establishes a conversational atmosphere, which will be nice later!

Ask the students to suggest team names. When every student but one has suggested one, call on that student to pick among the suggestions.

You may want to point out that your job is to help your students get the best grade they can. Unless they're obvious slackers or super-contributors, their grade will be determined by exam performance, not you. So you're on their side.

2 Probability Discussion

You may want to discuss probability in daily life. When is it a concern? Why do we not worry much about auto accidents (40K die per year), but focus our country to thwarting terrorism (3K died on 9-11)? What risks are worth taking? What % chance of death would you take for a million dollars? (How does this compare with the risk of dying in an auto accident this year, which is 1/6000.) How about for the experience of going into space? (After all, 2/88 shuttle flights have been fatal.)

3 Best-of-Five

We'll have some friendly inter-tutorial rivalry this term. Suppose that two tutorial teams, A and B, are nearly equal in ability. (Perhaps use your section's name and the course staff team, The King Tuts). We have:

$$\Pr\{A \text{ beats } B\} = \frac{1}{2} + \epsilon$$

If they play only one game, the weaker team might get lucky! (You might make reference to the intransitive dice demo in lecture, where the professor lost despite having a 5/9 chance of winning each game.) So suppose we have a best-of-five tournament to determine which team is better. What is the probability that the better team wins a best-of-five tournament?

Guide the students through the four-step method.

- Find the sample space by drawing out the tree diagram.
- Identify the event of intrest, the event that team A beats team B.
- Find the outcome probabilities by labelling arc and multiplying along paths.
- Find the probability of the event of interest.

In step four, guide students to the solution of the form $\frac{1}{2} + \frac{15}{8}\epsilon$. Explain why this is good enough when ϵ is small.

Follow up question: what is the probability that the stronger team wins if ϵ is small, say 1%?

If your students are quick, you might ask the approximate probablity that Team A beats Team B in a "tournament of tournaments". This is just two applications of the result just proved, giving $\frac{1}{2} + \frac{15^2}{8^2}\epsilon$.

4 GPAs

There are two students, Alice and Bob. In the fall semester, Alice's grade point average is better than Bob's. Inthe spring semester, Alice's grade point average is again better than Bob's. However, Alice is horrified to discover that for the year as a whole, her gradepoint average is *lower*. How is this possible?

One solution is as follows:

	Alice	Bob
Fall	A	AAAB
Spring	BBBA	B

5 Time sink

If you have extra time, this question should consume it! This is a polished version of the mangled question from the tutorial meeting.

There are three coins, A, B, and C. Each coin has a number written on either side. They are NOT necessarily fair. If you flip all three, then:

- More than half the time, A is greater than C.
- More than half the time, B is greater than C.
- Among all three coins, C is most likely to show the largest number.

How is this possible?

One solution is as follows:

- Coin A has 3 on both sides.
- Coin B has a 2 on one side and a 4 on the other. It is fair.
- Coin C has a 1 on one side and a 5 on the other. 60% of the time it comes up 1, and 40% of the time it comes up 5.